CONTRIBUTIONS

to

WESTERN BOTANY,

No. 12.

by

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CONTRIBUTIONS

to

WESTERN BOTANY,

No. 12.

NEW SPECIES AND NOTES.

The types of all species described are in my herbarium. The limits of the life zones are given in my previous Contributions.

Arabis Cobrensis n. sp.

Cobre, Nevada, on clay hills, June 16th, 1906, in the lower Temperate Life Zone.

Stems caespitose from a woody root; leaves 2-3 inches long, 1-2 lines wide, barely acute, entire, tapering to a short petiole, fascicled, densely stellate-pubescent; stem leaves the same but linear and with slightly enlarged and auriculate base, gradually passing into subulate-linear bracts, edges inclined to be revolute; inflorescence open, ample, of panicled racemes, 1-2 feet long, nearly smooth: fruiting pedicels 9-12 lines long, arcuate, reflexed, in flower 2-3 lines long and ascending; flowers light-purple, 2½ lines long; petals oblanceolate and rounded, half longer than the white-margined, oblong, obtuse sepals; stigmas capitate, sessile; pods 1 line wide and about 3 inches long, nearly straight, flat, smooth, barely acute at each end; seeds small, in 2 rows; valves faintly nerved to the middle: pods about an inch apart; flowers few and clustered at the ends of the branches.

Arabis Whitedi Piper is almost certainly a Draba.

Thelypodium deserti n. sp.

Amargosa Desert, April 27, 1907, at 4,000 feet alt., in loose

gravel in the Tropical Life Zone.

A weak and erect annual, much branched and stems tortuous but not climbing; racemes long and loose; lowest leaves 1-3 inches long with simple and linear lobes and petioled, the rest linear and entire; the whole plant except the very base is a loose inflorescence with straggling racemes; flowers minute, purplish-white, 1 line long, calyx ashy and equaled by the slender and indifferently spreading pedicel which in fruit elongates to 2 lines long; pods 6-9 lines long, acute at each end, arcuate, torulose, 1-2 lines wide, apex very blunt; whole plant nearly smooth. This has undoubtedly been mistaken for Streptanthus longirostris.

Thelypodium Diehlii n. sp.

Stout, erect, robust, and thick-stemmed, branched above, 2 feet high or more, glaucous and smooth; lower cauline leaves 4-5 inches long, oblong, entire, acute, auriculate-clasping, congested, and thick; racemes sessile, 2-4 inches long, densely flowered, stout, erect; pedicels slender, divaricate, 4 lines long; pods erect, sessile, 1 inch long; style ½ line long, stout, tipped by 2-lobed stigmas; flowers 2 lines long, white; anthers narrowly oblong, sagittate; biennial or perennial. Mound Valley Sierra Madre Mts., Chihuahua, Mex., 7,000 feet alt., Sept. 18, 1903, in meadows in the Middle Temperate Life Zone, Diehl. This corresponds well with the figure of T. Vaseyi, published by Coulter as to leaves and flowering branches with the immature pods which Robinson refers to Sisymbrium, but not to the fruiting branch which is different. As to whether the flowering branch is a Sisymbrium (linifolium) the writer has no opinion but this species cannot be a Sisymbrium.

Thelypodium longifolium var. Catalinense n. var. Pods erect, 18-24 lines long, on pedicels about 4 lines long. Catalina and Santa Rita Mts., Arizona, Aug., 1903. T. longifolium often has the filiform pods 3 inches long; the pedicels are about 1 inch long and capillary, ascending below and hooked above; the leaves have stellate hairs with a very stout foot arising from a seemingly pustulate base which when dry leaves a large rough spot around the hair. This is probably true of T. micranthum also, but the hairs are so thickly set that the surface of the leaves is rugose.

Lesquerella Cusickii n. sp.

Annual, prostrate with many slender stems; root leaves with the blade 5-8 lines long, nearly reniform and abruptly

contracted into a thick and flattened petiole 1-1½ inches long, to cuneate at base and spatulate, entire or with slightly wavy margins, thick and densely-silvery-stellate, gradually passing into spatulate, entire and small stem leaves 6-9 lines long without proper petiole; racemes about 2-4 inches long with several light-yellow flowers 3 lines long, ascending and in a head in flower, in fruit pedicels S-shaped (with the letter laid on its side), 6-8 lines long and slender; calyx lobes narrowly elliptical and obtuse, 2½ lines long, petals nearly linear and 3 lines long; pods (immature) on a short stipe, 1½ lines high and 2 lines wide, obcompressed, oblately rounded and almost truncate at both ends, the style a little longer than the pod; whole plant except the petals stellate-pubescent. No. 2367 Cusick. White clay hills, Willow Creek Malheur Co., Oregon, at about 3000 feet altitude, May 3, 1900. Dedicated to my good friend Cusick. This has the aspect of a Physaria, but the pods seem half mature and show a little tendency to inflation.

Isomeris arborea Nutt. The typical form also occurs on the Colorado Desert as well as the var. globosa Coville and some times on the same plant. The variety is not a good one.

Oxystylis lutea Torrey.

Purpus seems to have been the first botanist to collect this plant in bloom, but his specimens were so poorly dried that the character of the flowers is obscured. The writer had a chance to study this in bloom the past season and to clear up some mystery about it. It has the same habit as the other annual species of this family such as Cleome sparsifolia, lutea, and Polanisia, but it seems to prefer soil more nearly like that frequented by the Cleomellas, i. e. alkaline soil with much sand in it, and gravel, growing with Nama, Chaenactis Xantiana, the fleshy alkali-loving Phacelias, Atriplex canescens and hymenelytra, Suaeda, and Cuscuta salina(?). It never grows in clayey and alkaline flats without drainage such as some Cleomellas frequent. Flowers light-yellow, densely clustered; sepals margined but brown and acute only after anthesis; petals barely clawed, oval-elliptical, obtuse, concave, widely spreading; style upturned, acicular; stamens spreading and introrse and with subulate filaments; pods composed of two obovate lobes on either side of the base of the style, and at an angle to each other, didymous, smooth. These characters were taken with the fresh specimens in my hands. Other characters can be seen in the specimens. Blooms in April. Amargosa Desert, May, 1907.

Sphaeralcea caespitosa n. sp. Caespitose from a thick and woody root; whole plant densely white-stellate-pubescent; the short and slender stems erect, 2-6 inches long, unbranched; flowers in the upper axils and 2-3 in a short cluster at the end when the leaves are reduced to small and leafy bracts; lower pedicels stout, 3-9 lines long, upper much shorter but evident; leaves cuneate-ovate or cuneate obovate, the blades 12-18 lines long and at least equaling the stout petiole, incisely serrate, rarely obscurely 3-lobed, palmately veined; stipules long-linear, entire, 6 lines long, caducous; bractlets filiform, nearly 6 lines long, on base of calyx; calyx nearly 1 inch long, when fresh sharply angled and pyramidal, due to the rigid and subulate and erect lobes, cleft nearly to base; corolla red, about as long as the calyx or less; fruit densely hoary, depressed-globose, about 3 lines high, of many carpels which open on the back at the top and are 2-seeded and are scabrous on the inner face above and reticulate-meshed below, nearly reniform and without cusps. This is very remarkable from the few and very large flowers and peculiar habit. Related to S. Emoryi. Wa Wa, Western Utah, west of Frisco, at Dry Station, June 25, 1906, growing on very poor volcanic soil covering lava with a shallow coat, and in the crevices of the rocks where there is a little soil, along with Aplopappus, Cymopterus, n. sp., etc. in nearly bare places.

Sidalcea Neo-Mexicana var. Diehlii n. var.

Carpels reticulated on the back and meshes running down on the sides, fruiting pedicels 6-12 lines long; calyx hispid; plants 18-30 inches high. Round Valley, Chihuahua, Mex., Sept. 17, 1903, 7,000 feet alt., and Pleasant Valley, near Colorado Springs, Colorado, Sept. 25, 1878, Jones.

Hibiscus Coulteri var. brevipedunculata n. var.

Peduncles none to 1 inch long; flowers smaller; shrubs woody to the top. Congress Junction, Ariz., May 4, 1903.

Kosteletzkia Madrensis n. sp.

Shrubby below, about 8 feet high, stems tufted and willow-like, paniculately branched above; leaves hastate, 3-4 inches long, 1-1½ inches wide, closely and doubly crenate, sparsely rough-pubescent, acuminate, on petioles 1½ inches long; flowers brilliant-purple; petals fully 1 inch long, not opening, about half the stamineal column; calyx about 4 lines long, with triangular and acute lobes over half the whole, longer than the

5 hispidly margined carpels; stamens many; bractlets filiform, as long as the calyx tube; central pedicels filiform, kinked in the middle, 1-2 inches long, others short; flowers erect in very open panicles. Guayanopa Canyon, Sierra Madre Mts., Chihuahua, Mex., Tropical Life Zone at 3,600 feet alt., Sept. 24, 1903.

Cerastium Diehlii n. sp.

This is like C. sericeum but perennial; many-stemmed, dichotomously branched above; leaves linear-acuminate, 1-3 inches long, 2-3 lines wide, viscid and hairy throughout but not densely so; otherwise as in C. nutans; plants about a foot high. Hop Canyon Magdalena Mts., N. M., Aug., 1903, Hillsboro Peak, N. M. and Bear Canyon north of Fierro, N. M. I. E. Diehl.

Scopulophila n. gen.

Illecebraceae. Caespitose shrub 2-6 inches high with herbaceous stems; flowers 1-2, sessile in the axils and subtended by 2 petaloid bracts like the sepals which are nearly 1 line long; calyx faintly 5-nerved, and 5-cleft nearly to the base into oval-ovate, simply apiculate, hyaline sepals barely 1 line long, with thick and green midrib vanishing toward the top, sepals inclined to be conduplicate but little spreading in the pistillate flowers and surpassing the bracts somewhat; flowers dioecious, the pistillate narrower; stamens 5, about as long as the sepals; ovary oval; leaves linear oblanceolate.

Scopulophila nitrophiloides n. sp.

Whole plant smooth, but on drying becomes roughened by the wrinkling of the rather fleshy pulp; stipules conspicuous, laciniate, at the base of the stems they are densely aggregated as the scales in ferns are, forming a bulb-like tuft; stems knotted at the joints and branched at every joint. with appressed branches which fork again; leaves flat, thick, acute, widely spreading, 6-9 lines long, gradually reduced above; all the upper axils floriferous; staminate flowers inconspicuous, pistillate evident and resembling Galium multiflorum at a distance; on close inspection the plant so closely resembles Nitrophila that only the stipules separate the genera readily. This grows in the crevices of dry and very hot rocks at Indian Spring, Charleston Mts., Nevada, in the Tropical Life Zone: just in bloom May 7, 1906, 4.000 feet alt., also in the Mts. north of Amargosa Desert, May 27, 1907, in bloom. This ranks with Oxystylis in its oddity.

Geranium Madrense n. sp.

Caespitose, coarse; stems and petioles retrorsely almost hispid; leaves sparsely pilose; inflorescence glandular-hispid; root leaves sparsely hairy, many, with petioles 6-8 inches long, blade about 2-3 inches wide, reniform, with rounded and open sinuses, 5-lobed and lobes cuneately again 2-5-lobed and these incised, all apiculate, nerves about 10 from top of petiole, prominent and conspicuously sinuous and with branches sinuous above; stem leaves few, sessile or nearly so and deeper incised, little reduced; peduncles about 1 foot long and then umbellately few-branched, these with 2-5 stout pedicels all about 1 inch long, erect and not hooked; sepals 6 lines long, elliptical, 5-nerved, with a mucro 1 line long, purple; fruit 1½ inches long, with lobes at base about 3 lines high and as wide; beak slender ¾ inch wide; petals bright-purple, about 1 inch long, very broad, about 2-3 times the sepals, not reflexed. Meadow Valley and Chuichupa, Chihuahua, Mex., 7,000 feet alt., in meadows, Sept. 17, 1903.

Rhamnus serrata var. scopulorum n. var.

A low shrub with the habit of R. Californica; twigs purplish, but mostly covered with a whitish bloom or scale, season's twigs densely velvety; leaves 2-3 inches long, narrowly elliptical-lanceolate and acuminate, closely and finely serrulate, cuneate to truncate at base, 3-5 lines wide, glabrous above; velvety below, not revolute, prominently pinnate-veined; petioles 2-3 lines long, stout; peduncles none; flowers 1-3 at each node; pedicels in fruit nearly as long as the petioles and slender; fruit oblately obovoid and depressed, 2 lines wide, 3-seeded. This differs from R. serrata in the velvety not viscous leaves with obtuse base. Near Chuichupa, Sierra Madre Mts., Chihuahua, Mex., in the upper end of Guayanopa Canyon at 5,000 feet alt., in the Lower Temperate Life Zone, Sept. 23, 1903.

Mimosa canonis n. sp.

Very tall and strict herbs with coarsely striate stems; pinnae many pairs, about 20, leaflets broadly linear, 1½ lines long, glabrous; fruiting peduncles stout, 2-3 inches long; flowers in heads; leaves 3-4 inches long; whole plant spineless and smooth; pods linear, 3-4 inches long, 3 lines wide, smooth, long-beaked, abruptly narrowed below and then 2½ lines wide; nerves thin, sparingly beset with white bosses representing the bases of prickles, nearly straight, many in a head. Guayanopa

Canon Sierra Madre Mts., Chihuahua, Mex., in the Lower Temperate Life Zone, 5,000 feet alt.

Cassia leptocarpa var, glaberrima. n. var.

Leaflets 6 pairs, 2 inches long; whole plant glabrous and inclined to be glaucous, rigid, tufted, erect, herbaceous from a thick and woody root; flowers on a peduncle not over 1 inch long, shortly racemose on long pedicels which equal the peduncle; pods often a foot long, 2 lines wide with tumid nerves. It has the appearance of a Desmanthus. On the upper edge of the Tropical Life Zone Huachuca, Catalina, and Santa Rita Mts., Arizona, Aug., 1903.

Tephrosia leucantha var. acuta n. var.

Leaflets 10-12 pairs, lance-oblong, acute; calyx short-hairy but hairs fuscous and spreading; pods at length nearly smooth; leaflets about 1 inch long and 2-3 lines wide; like the type in being very shortly-petiolulate; calyx lobes subulate. Quite a marked variety. This seems to be what is called T. Virginiana in this part of Mexico. San Diego Canon, Sierra Madre Mts., Chihuahua, Mex., 6,400 feet alt., Lower Temperate Life Zone, Sept. 16, 1903.

Tephrosia viridis n. sp.

Plants appearing glabrous throughout but really very minutely pubescent, except on the pods and upper sides of the leaves. Shrubs 3-4 feet high with slender stems; racemes long, compound or simple, 6-12 inches long; leaflets on very long petiolules, 1½ inches long, 3 lines wide, acutish at least at base, veiny, darker above, 4-8 pairs; leaves about 4 inches long, on short and angled petioles; fruiting pedicels 4 lines long, stout, appressed; calyx teeth triangular, about as long as the tube, 1 line long; flowers 6-8 lines long, broad, purple, rather many; pods 3 inches long, 3 lines wide, green, smooth, flat and uneven, nearly straight and erect. Guayanopa Canon, Sierra Madre Mts., Mex., Sept. 24, 1903, in the Tropical Life Zone, 3,600 feet alt.

Dalea albiflora var. brevibracteata n. var.

Bracts very short and not visible on the spikes. Colonia Juarez, Chihuahua, Mex., 6,000 feet alt., also Guayanopa Canon and San Diego Canon, Sept., 1903, in the Lower Temperate Life Zone.

Dalea inflata n. sp.

Resembles D. alopecuroides very closely but is widely branched and stouter, with shorter internodes and angled

stems. Heads sessile or short-peduncled, oblong-ovate in flower, 6 lines long, in fruit about 1 inch long and rarely oblong, about 6 lines wide; bracts very short and not visible even in flower, ovate, broadly hyaline, glabrous: calyx globose, greatly inflated, 3 lines long, with nearly closed throat, teeth subulate and very short, throat long-villous and tube villous within, otherwise smooth: nerves 10, double, black, and with several linear and wax-colored glands in the intervals; pods flat, nearly round, included in the calyx, smooth and glandular. Round Valley and Meadow Valley, near Chuichupa, Chihuahua, Mex., in the Sierra Madre Mts., 7,000 feet alt., growing in grassy parks in the Middle Temperate Life Zone, Sept., 1903.

Dalea arenaria n. sp.

Prostrate forming mats 4 feet in diameter, annual from a deep yellow root; stems divaricately much branched throughout, flexuous, slender; internodes rarely surpassing the leaves; whole plant glabrous and glaucous, leaves and inflorescence very glanduliferous, stems sparsely so; leaves about 1 inch long with petioles 4 lines long, rachis green and gland-bearing, widely spreading; leaflets very thick, obovate-cuneate and retuse with large glands, about 6 pairs, 3 lines long, on long petiolules; peduncles stout, opposite the leaves; 6-18 lines long; spikes linear, 2-4 inches long, very loose in fruit; bracts thick, green, 1 line long, reniform, often emarginate but always conspicuously and abruptly caudate at tip, the whole reminding one of the sting-ray fish, not nerved nor reticulated, with 3-4 large yellowish glands on each side along the tip of the broad part, embracing the calyx and persistent, marginless; calyx very thin and hyaline and shining below, with 3-4 glands in the intervals, with 10 stout ribs, turbinate; the broad triangular calyx lobes lacerate, about one-third the calyx and then caudate prolonged as much more; flowers deep-purple, blades 2 lines long and wide; stamens long-exserted; pods smooth, slightly exceeding the calyx, half reniform, gland-bearing. Grows in sand dunes at Sapio and Sabinal, Chihuahua, Mex., in the Tropical Life Zone, Sept. 10 and 29, 1903. This is closest to D. lanata probably, but it seems to be related to D. glaberrima and D. scariosa of Watson. It has the habit of D. Parryi and D. mollis.

Dalea terminalis, n. sp.

Perennial; stems slender, many, divaricately much branched, prostrate from a woody root, forming masses 2-4

feet in diameter, whole plant softly short-pubescent with spreading and rather coarse short white hairs, not woolly; leaves about 1 inch long; leaflets 3-6 pairs, cuneate-obovate, retuse thick, prominently glandular dotted, 2-4 lines long, approximate; internodes shorter than the leaves; spikes on terminal peduncles 1-2 inches long, dense, about 1 inch long, broadly linear; flowers not reflexed; bracts rhomboidal, very villous, acute, about as long as calyx, 1 line long, persistent, with a line of large yellow glands on the margin, caudate with an abrupt acumination; calyx turbinate, obpyramidal and angled by the stiff ribs, smooth and shining and hyaline except at the top which is coarsely hairy like the leaves; calyx teeth deltoid-triangular and rarely half the tube, hairy; blades of petals about 1 line long, very deep-purple, much exceeded by the stamens; pods half-reniform, pubescent like the leaves, 1 line long, gland bearing at the top between the ribs. Common at El Paso, Texas, in the Tropical Life Zone, also Albuquerque, in the same zone. Also at Billings in the upper Temperate Life Zone. Grows in sand dunes and very sandy places. This differs from D. lanata to which it has been referred in the pubescence not woolly, calyx teeth twice shorter, and rhomboidal bracts. It differs from D. arenaria in the pubescence, duration, and not caudate calyx teeth. But the three species are evidently closely related.

Lotus Madrensis n. sp.

Very closely allied to L. Torreyi but bracts petioled and with 1-5 leaflets at the end; whole plant minutely pubescent; calyx teeth as long as the tube and subulate; banner and keel tip yellow; wings white, 5 lines long; fruiting peduncles often 6 inches long and stout; pods several, straight, linear, 2½ inches long, 1 line wide; leaflets 9-11, 9 lines long, elliptical-cuneate, acute, glabrous above. Tufted plants with decumbent and rooting base, and then erect, growing in cold springs with roots covered with water; perennial. Chuichupa, Sierra Madre Mts., Chihuahua, Mex., Sept. 26, 1903, in the Middle Temperate Life Zone.

Lotus debilis n. sp.

This belongs to the same group as L. Chihuahuana, caespitose, prostrate perennial with filiform branching stems a few inches long, with short internodes; leaves about 6-9 lines long, on a petiole 4-6 lines long, delicate, nearly smooth; leaflets about 3 lines long, rhomboidal-obovate-cuneate, 3-5, mostly 3; whole plant nearly smooth; fruiting peduncles filiform, 2-3 inch-

es long, with 1-2 erect and linear pods which are 1-2 inches long, 1 line wide, many seeded, simply acute at each end, erect; calyx tube not 1 line long with the subulate teeth as long as tube. Guayanopa Canon, Sierra Madre Mts., Chihuahua, Mex., 5,000 feet alt., in the Lower Temperate Life Zone, Sept., 1903. This is the most delicate species of all.

Lupinus Huachucanus n. sp.

Acaulescent and caespitose from thick and short roots; petioles filiform, 3-7 inches long; leaflets 6, elliptical-oblanceolate, sharply acute at both ends, soft and thin, 1-1½ inches long, sparsely silky with long and spreading slender hairs which also extend to the petioles; peduncles erect, 6 inches long, the upper half racemosely flowered; calyx villous, upper lip broad and short; flowers about 6 lines long; pods narrowly oblong, 1 inch long, 3 lines wide, appressed and erect, 3-4 seeded, shaggy; pedicels in fruit 2 lines long, stout. Santa Rita Mts., Arizona, in pine woods, 6,000 feet alt., Middle Temperate life Zone. Out of flower.

Lupinus [redacted] n. sp. Howardi

Caespitose and acaulescent from a much-branched and slender root the branches horizontal and spreading under ground, runner like, and ending in a small crown about 6 lines wide; slendor petioles 2-4 inches long, appressed hairy; leaflets 6-7, obovate to broadly oblanceolate, 9-12 lines long, obtuse but apiculate, nearly glabrous, roughened on the upper side and dark-green, glaucous below, the young leaves at first silvery. Apparently an early bloomer, common, out of fruit and flower but a very marked species. Mound Valley, near Chuichupa, Sierra Madre Mts., Chihuahua, Mex., 7,000 feet alt., Sept. 18, 1903.

Lupinus Diehlii n. sp.

A slender and erect perennial with tufted stems 2 feet high, branched above, leafy; petioles about as long as the 7-8 nearly linear and acute leaflets which are 2-3 inches long and glabrous when mature; peduncles about as long as the leaves; spikes often nearly a foot long, dense; flowers blue, 4 lines long, on filiform pedicels; about 3 lines long in flower and 6 lines long in fruit and then very stout; bracts subulate, very deciduous, 2 lines long; calyx short, upper lobe short and deeply cleft; pods nearly linear, 1-2 inches long, not over 3 lines wide, about 8-seeded, appressed hairy and falcate. Common in the woods of the Sierra Madres, near Chuichupa, Chihuahua, Mex., at

6,000-7,000 feet alt., in the Middle Temperate Life Zone, Sept., 1903.

L. Diehlii var debilis n. var.

A more slender form with pods 2 lines wide and linear leaflets. Round Valley, near Chuichupa, Chihuahua, Mex., Sept. 17, 1903.

NOTES ON ASTRAGALUS.

Quite a number of species of Astragalus have been published since my last Contributions. The following are notes on them:—

Astragalus amphidoxus Blankenship is A. microcystis.

Astragalus divergens Blankenship is A. decumbens.

Astragalus Kelseyi Rydberg is A. arrectus, a form approaching the variety Spencianus, according to duplicate type specimen at Bozeman.

Astragalus urceolatus Greene is A. oocalycis Jones. It is in the same condition as the original specimen and appears to be an abnormal form of A. racemosus infected by insects or fungi which has caused an arrested development of the pod and an abnormal inflation of the calyx, as was suggested in the original description.

Astragalus iodopetalus Greene is A. Shortianus.

Astragalus Titi Eastwood is A. tener.

Astragalus proximus Green is A. strigulosus.

Astragalus cyanoseminus Greene is A. calycosus.

Astragalus simulans Cockerell is A. mollissimus.

Astragalus recedens Greene is A. Pattersoni.

Astragalus aculeatus Nelson is A. tegetarius.

Astragalus sinuatus Piper as to the type specimen in the herbarium at Pullman, is nearly typical A. Gibbsii, with glabrous pods and not A. speirocarpus as I was led to believe from his imperfect description.

Astragalus Helleri Fenzl., Linnaea 30 p. 77, which is Heller's number 236 I find was never published and is a nomen nudum.

Astragalus funereus n. sp.

This species was gathered at Rhyolite, Nev., April 11, 1907, in clay soil mixed with loose gravel on high ridges where the soil was very poor, 4,300 feet altitude. Flowers almost exactly those of A. Utahensis but banner with white sides and tip, or only pinkish. Calyx somewhat inflated and hyaline, a trifle constricted at mouth, straight but upper side a little

arched, a trifle laterally compressed, tips brown and triangular and about equal, tube 4 lines long, 2 lines high, 1¾ lines wide; banner oval-ovate with blade 8 lines long, and 6 lines wide, ascending in a gentle arc to 45 degs. from calyx tube, sides reflexed 2½ lines wide in the middle to 45 deg., plane, sulcus deeply V-shaped, fully 1 line deep and less than 1-2 line wide and abruptly widening 3 lines below tip of blade, most of the sulcus is deep purplish and veined with white on the edges, which spot present as a narrow band; wings concave to the keel, 1½ lines wide at base to the middle and then contracted to 1 line wide for 2 lines in length from the tip, very blunt and rounded, a trifle declined; claws not evident, just equaling the keel; keel very flat and shaped nearly like the pod of A. Antiselli namely about half-ovate-lanceolate, 6 lines long, 2½ lines high, wings and keel pink purple; banner about 2 lines longer than keel. Pubescence of leaves crinkled hairy; flowers mostly with bractlets at base; bracts ovate-triangular, 1 line long, green, with brown hairs. Plants with the stems and habit of A. Utahensis, and the pods of A. coccineus, thin, mostly obcompressed at base, sessile, one-celled, sparsely woolly, arched most at tip like A. inflexus and with tip flattened and very sharp, walls very thin for this group and with almost no pulp. Stems prostrate, with peduncles erect in flower, pods generally about 2 inches long and general outline oblong-lanceolate.

Parkinsonia Thornberi n. sp.

A very graceful and delicate tree like the weeping willow, hitherto referred to P. aculeata. It differs from the species in the rachis being only slightly flattened and not winged and much longer and narrower; leaflets very narrow and seldom longer than the width of the rachis. Gathered on the Guaymas slope on the road from Benson to Guaymas in southern Arizona and planted in the campus of the State University at Tucson where it flourishes.

Cologania longifolia var. stricta n. var.

Not climbing, 1 foot high, erect, from a long and erect woody root; stems few, very slender; fully developed leaflets about 4 inches long, 2-3 lines wide, about triple the petiole; whole plant nearly glabrous, the pubescence being sparse and minute and closely appressed; pods reflexed and narrow, 1½ inches long; flowers 9 lines long, deep purple. All the Cologanias of this class have deep, large and thick roots. In pine

mesas, 6,000-7,000 feet alt., Sierra Madre Mts., Chihuahua, Mex., near Chuichupa, Sept., 1903.

Desmodium crassum n. sp.

Erect, somewhat branched, rather stout, perennial; with shaggy stems, petioles and peduncles, but hairs straight and pubescence of leaves soft and short: rachis of leaf about 6 lines long and very stout; petiole 1-2 inches long; leaflets thick and veiny, penninerved, 1½-3 inches long, elliptical to oblong-lanceolate, obtuse; racemes panicled and proper peduncles not longer than the leaves, but the racemes themselves a foot or more long; flowers geminate on filiform pedicels about 2 lines long; stipules persistent, red, subulate and reflexed; bracts scale-like, smooth (long-ciliate on the margin), many, striate, coriaceous, broadly ovate and clasping, 3-4 lines long, yellowish, deciduous; flowers 3 lines long, purple; calyx tube cleft nearly to the base with long subulate teeth which equal the flowers; pods linear, about 2 inches long, of round, small joints (about 8), uncinate-puberulent, nearly sessile. Evidently near to D. cinerascens. Guayanopa Canon, Sierra Madre Mts., Chihuahua, Mex., in the Tropical Life Zone, Sept. 24, 1903.

Desmodium Wislizeni var. venulosum n. var.

Uppermost leaves broadly linear, often 2 inches long, all dark-green and conspicuously venulose; inflorescence minutely pubescent with spreading hairs; petals deep blue 1½ lines long; leaflets all reflexed. Santa Rita Mts., Arizona, in the Lower Temperate Life Zone, 4,500 feet alt., Aug. 24, 1903. What I take to be the type of D. Wislizeni was collected in Guayanopa Canon abundantly. Only the lowest leaflets are single in both forms.

Desmodium Coloniense n. sp.

Annual, erect, strict, much branched, with ascending and very long branches with internodes 2-4 inches long and sulcate; whole plant minutely pubescent but seeming smooth; stipules setaceous, filiform, rigid, not reflexed, 3-4 lines long, black-ribbed, persistent; bracts similar but nearly filiform, persistent, 3 lines long; leaves on stout sulcate petioles 6-9 lines long, the more slender rachis half as long; leaflets linear, mostly obtuse, almost sessile, rigid, 1-nerved, with prominent veinlets on either side forming oblong meshes, 2-4 inches long, not reflexed; inflorescence panicled, but racemes sessile and 6-12 inches long; pedicels filiform, about 1½-2 inches long, geminate, bearing a minute calyx; petails 1 line long, whitish with blue

keel; joints orbicular 1½ lines long, on a stipe as long as the calyx, plane, smooth, ciliate. This has the habit of D. gramineum, the stipules and inflorescence of D. Wislizemi. The leaflets are those of the former but three and on a manifest petiole. It also resembles D. Arizonicum. Colonia Juarez, Chihuahua, Mex., 5,200 feet alt., in the Tropical Life Zone, Sept. 11, 1903.

Phaseolus angustissimus var. latus n. var.

Only the uppermost leaflets linear and even these inclined to have an enlarged but not lobed base which is broadly cuneate; middle leaves with narrowly triangular leaflets; lowest leaves with leaflets 6-8 lines long, 3-4 lines wide, truncate at base and obtuse at tip, with straight sides, triangular. It has the characteristic open habit of the species with its very long internodes and short petioles. On the Little Colorado River, northern Arizona, below Winslow, June 9, 1890.

Phaseolus Ritensis n. sp.

This closely resembles P. retusus but the leaves are rhombic-ovate with a very broadly deltoid base and acute and strongly apiculate tip, rarely obtuse, never retuse, smooth; whole plant smooth except the minutely pubescent peduncles petioles and stems; peduncles slender, 1-2 feet long; pods glaucous, 1½ inches long, with a sharply falcate and triangular rather long-stipitate base, about 3-4 lines wide, tip strongly beaked; bracts minute. What I take to P. retusus has short peduncles, broad and sessile pods and conspicuous and persistent bracts about 4 lines long. Santa Rita Mts., Arizona, Lower Temperate Life Zone, 4,500 feet alt., Aug. 24, 1903.

Phaseolus prorifirus n. sp.

A tall and climbing herb with rhombic ovate abruptly acuminate leaflets which are about 2 inches long, smooth, entire; peduncles including the rachis not over 4 inches long, stout, several flowered usually with one pod which is 4 inches long and 3 lines wide, narrower below, straight, smooth, with a deflexed subulate beak 6 lines long. Guayanopa Canon, Sierra Madre Mts., Chihuahua, Mex., in the Tropical Life Zone, 3,600 feet alt., Sept., 1903.

Philadelphus serpyllifolius var. argyrocalyx. Wooton Torr. Bull. 25, 452 is P. Mexicanus Schlect.

Rubus Madrensis n. sp.

Stems long and slender and freely branching, glaucous and smooth, armed like the petioles with stout, permanent, flattened, recurved and hooked pricles; leaves of 3, ovate-lanceo-

late and acuminate leaflets, 1-3 inches long, doubly serrate and teeth spinulose, base truncate, lower side white with compact and very fine wool, upper side green and nearly glabrous, veins conspicuous; fruit red, about the size of R. leucodermis and whole plant closely resembling that species; no straw-colored deciduous needles. Chuichupa, Sierra Madre Mts., Chihuahua, Mex., Middle Temperate Life Zone, Sept., 1903.

Pyrus Ioensis is almost uniformly credited to Bailey but he is not the author of this combination. Carruth in his Catalogue of Kansas plants, page 48 (1877), published this name four years before Bailey used it in American Garden 12, 473 (1881). The proper name of the plant is Pyrus Ioensis Wood, in Carruth Cat. Kans. 48 (1877).

Potentilla nervata n. sp.

Erect, strict, 1½ feet high, slender; stems leaves about 3, distant; whole plant glabrous or nearly so except the young leaves and the coarsely villous calyx; root leaves with glabrous stipules and sheaths; lower stipules linear-subulate, upper obliquely lanceolate, entire; basal petioles 3-4 times the leaflets; leaflets 5, digitate, linear-oblanceolate to oblong-oblanceolate, 1½-2 inches long, sharply serrate to within half to two-third of the end, cuneate below, with very thick midrib, obtuse; upper stem leaflets linear; flowers corymbose; fruiting pedicels slender, 1-2 inches long below; calyx 5 lines long, lobes broadly triangular, 1½ lines long in fruit, very acute, bracteate, about two-thirds as long and blunter but very small and narrow in flower; petals yellow, obcordate, 3-4 lines long; seeds ½ line long, obliquely ovate and spirally nerved with branching nerves. This has the seeds of P. Thurberi nearly and the flowers and habit of P. pulcherrima. Mound Valley near Chuichupa, Sierra Madre Mts., Chihuahua, Mex., at 7,000 feet alt., in the Middle Temperate Life Zone, Sept. 18, 1903.

Oenothera (Sphaerostigma) deserti n. sp.

Habit of O. chamaenerioides in the slender stems, inflorescence, leaves and pubescence; lower bark scaling off in flakes, white; most of the leaves linear, the lower remotely denticulate; pods not contracted at either end, 1½-2 inches long, ½ line wide, somewhat reflexed at base and variously arched above; calyx tube 4 lines long; petals 3-4 lines long, white; sepals puberulent, spreading and not reflexed; style exserted. This appears like a hybrid between O. strigulosa and O. chamaenerioides but the former is not known within 200 miles of

this locality. Needles, California, May 5, 1884, and Chimehuevis Mts., Arizona, April 21, 1903.

Oenothera gauraeflora var. vermiculata n. var.

Prostrate, nearly glabrous, with several branches bearing dense tufts of leafy-bracted spikes at the ends; leaves linear-oblanceolate, 2-3 lines wide, 1-2 inches long; petioles half the whole and very slender; flowers about 1-2 lines long, pods nearly glabrous, much coiled and twisted, 6-9 lines long, with 4 very broad and thick angles leaving a deep crease between. This is very marked but intergrades with the species. Reno, Nevada, June 10, 1897, and May 27, 1903.

Petalonyx Thurberi var. nitidus (P. nitidus Watson Am. Nat. 7, 300). This intergrades with the type.

Mentzelia albicaulis var. spectabilis, n. var.

Petals 4-6 lines long, bright yellow; lower leaves linear and deeply pinnate lobed, upper triangular and mostly entire; internodes long and shining. A very conspicuous form and very common from Arizona to Death Valley and Owen's Valley, California.

Mentzelia Diehlii n. sp.

Stems several from an erect tuber which is about 3 inches long and 1 inch thick; habit of M. hispida; leaves ovate, petioled, 1½ inches long, doubly toothed; flowers terminal; petals 6 lines long, orange; calyx lobes linear, 3-4 lines long; immature pods 6 lines long, 2 lines wide, on a pedicel 2-3 lines long; whole plant ashy-hispid and very adhesive; stems stout, 1 foot long, erect, nearly simple. This accords fairly well with M. scabra HBK. Nov. Gen. & Sp. 3 405, but that is said to differ from M. hispida only in the stamens, while this is much different from it. It also grows only in the Andes. Colonia Juarez, Chihuahua, Mex., 6000 feet alt., in the Lower Temperate Life Zone, Sept. 12, 1903.

Mentzelia ctenophora Rydberg is only the common robust form of M. albicaulis.

Cymopterus (Aulospermum) basalticus n. sp.

Acaulescent or with stems not rising above the ground or much exceeding the old leaf-sheaths, from a fleshy rather elongated and little branched thick root; crowns one to several, densely clothed with the fibrous 1-2-inch-long old leaf sheaths, underneath which and rising above them are 3-5 new, ribbed, hyaline leaf bases imbricated and about 6 lines wide embracing and mostly concealing the very short stems from

which arise very stout ascending peduncles about 5 inches long and 1-1½ lines thick; whole plant even to the fruit bluish-glaucous and perfectly smooth, the flowers white or purple; peduncles, rays and petioles round and thick when green, rather sulcate when dry, all very stout and leathery, the bases of the petioles abruptly enlarged into leaf-sheaths below; leaves yellowish above, 2-3 inches long, the petiole being nearly twice as long as the blade, which is 1-1½ inches long and reniform to oblong-cordate, 3-5 lobed and lobes pinnate and fan-shaped and imbricated, these closely deltoid-toothed and every third tooth cut deeper, all teeth apiculate, when dry surface is roughened by shrinkage of the very leathery pulp, but perfectly smooth when fresh; rays 6-8 lines long, of variable thickness in the same umbel, widely spreading; without involucres; involucels of about 8 oval to triangular, hyaline margined, lacerate, caudate, stiff bracts about 2 lines long, which are united below; flowers sessile, about 10; fruit from the very first broader than long with wings wider than body, and emarginate at both ends, the most mature fruit is apparently not over half developed and is about 2 lines long, apparently like that of **C. Rosei** (Aulospermum Rosei Jones C. & R. Umb. 179); wings 3. the central one variable, the later ones broad and well developed, the margin being rounded and as thick as the other part or thicker and not thinner as in the former, the base is thickest as in that species then becomes thinnest and then a trifle thicker from the middle of the wing to the edge as is the case with that species except at the very edge; oil tubes several, but hard to make out. This remarkable species is closely allied to C. Rosei, yet differing very widely; it has the same tuberous root at the end of a very long underground stem which branches at the top, the same crowns covered with old and new leaf sheaths, but the crowns are thick and the stems thick, while in the other they are small and the stems almost filiform, the leaf dissection is very different, though the color is much the same on both sides, though in Rosei the glaucous color is scarcely evident, the purple young fruit is the same, and color of the flowers, the peduncles are about the same, but the rays very much stouter and raylets none. C. Rosei shows marked relationship in habit and leaves to the C. purpureus group, though also growing in the soil frequented by the C. montanus and C. corrugatus groups. This species, however, grows in the crevices of nearly bare basaltic rocks on

knolls where there is very little soil covering the rocks and where there is very little other vegetation, or its roots go down through the shallow soil and hide in the crevices as is the case with the C. purpureus group, though that prefers sandstone rocks on mesas among the junipers, while its resemblance in other respects is with the C. corrugatus and montanus and C. Newberryi groups. This is simply another link in the series showing the futility of trying to divide the species into separate genera. This species was gathered at the half way station near Wa Wa, Utah, west of Frisco, at 7000 feet alt., on a bare knoll among the junipers, soil apparently not alkaline.

Cymopterus globosus Watson.

Coulter & Rose on page 183 state that this is a very rare species. On the contrary, it is one of the most common species of the genus and abounds from the Fish Springs mountains, western Utah, to the Sierras and southward at least to Goldfield. The fact that they have seen so little material of this species is probably the reason why they have not also given it a new name under their genus Rhysopterus, as it is closely allied to C. corrugatus and has the same corrugated wings in varying degree. They certainly err in placing C. corrugatus and Rhyspoterus Jonesii in that genus if their figure of the type species of that genus is correctly drawn, as these two species have nothing in common with it. The wings of these species are thickest at base of cross section, oblong in outline till near the edge and then they grow thin and sharp as is common in the C. purpureus group. They err again in referring C. megacephalus as a close relative of C. globosus, as they have little in common. C. megacephalus is evidently related to C. Newberryi and that group having the wings reduced to a knife-edge close to the fruit and then widening as shown by me in Zoe.

Cymopterus corrugatus Jones. This rarest of the Cymopteri has been obliterated in its type locality. It has never been collected in ripe fruit but once. I made a special trip to the type locality to get it in good fruit, but it is gone. I gathered it fortunately in nearly ripe fruit at Mill City on drifting sand, and in 1907 in similar situations below Hawthorne and Copperfield near there, but the fruit was not fully ripe. So we are assured that some time the fruit will again be found mature. Its characters hold well as described, in all the new specimens. The root is a tuber as in all the allied species, and

stems single.

Cymopterus corrugatus Var. Coulteri n. n. Rhysopterus Jonesii C. & R. Umb. 186 (1900).

Cymopterus Parryi (C. & R.) Jones. Coulter and Rose state that this species is said to come from the mountains instead of the plains (p. 182), but they do not give their authority for it. It is an error, at any rate, for the plant grows on the adobe plains of the Bad Lands of Wyoming, where I collected it, at Granger and Carter, as referred to on same page. I see nothing to separate this from C. glomeratus; as a rule the leaves are more reduced as well as the fruit wings, due to the poor soil on which it grows, and yet with all this isolation for ages past the same kind of leaves and fruit occur on specimens gathered along with the type as are found in C. glomeratus, and so the species must fall. I have it from Ketchum, Idaho, the most western locality reported so far.

Cymopterus Fendleri Gray. I still maintain that this cannot be separated from C. Newberryi by any character that sticks. The characters given by Coulter & Rose do not hold. The involucre is as often absent as present; you can get in the same locality a complete transition in the leaves. It is not always easy to separate this from C. glomeratus.

Cymopterus Fendleri var. Newberryi (Watson). Peucedanum Newberryi Watson Proc. Am. Acad. II 145 (1876). This should be kept up as a variety.

The new genus Aulospermum C. & R. is a curious mixture for splitters. As arranged by them it contains two groups having little affinity for each other, but great affinity for two other genera of theirs. This group of A. longipes, glaucus ?, Watsoni, and Ibapensis, is characterized by having deep and thick vertical tuberous roots and mostly single and long fleshy prolongations connecting with the surface, and there single or few branched crowns on them which when young rest on the surface and the leaves spread out in a flat rosette till after flowering time, the foot then elongates and raises the whole crown and leaves and fruiting pecuncles often a foot in the air, but the plant is acaulescent. The leaves are fleshy as well as the whole plant, and soft, glaucous, with blunt lobes, and with large hyaline non-fibrous root sheaths, without petioles when dead. The fruit is very thin-winged, the cross section of the wings being filiform and of almost the same width throughout, though a shade wider at insertion and thinner at

edge; the fruit is oblong, 2-3 lines long, with very wide wings, but the whole outline is oblong. All these species grow on gravelly or clay soil, mostly in the valleys at low elevations, though A. longipes grows up to 9000 feet alt. in the mountains on mesas, and they often grow in alkaline soil, A. Ibapensis always so; the flowers are light yellow to white, often with purple anthers. The relationship of this group is with their Phellopterus. The other group embraces A. Jonesii, purpureum, Rosei, and C. basalticus. This group is intimately related to Pteryxia and shades into it. It is characterized by somewhat fleshy horizontal branching roots, variously tuberous enlarged, foot not elongating to speak of, rather narrow (for the length) and fibrous root sheaths, crowns several (but not caespitose as in Pteryxia), stems evident, but the internodes shorter than the leaf sheaths; leaves coriaceous, not fleshy, very rigid and mostly acerose tipped, mostly much dissected with minute or small final divisions, though in half the species the dissection is much less and lobes larger. A. Rosei and C. basalticus are transitions to Phellopterus; fruit including the wings almost as broad as long and deeply emarginate at both ends, the wings being much wider than the body, about 4 lines long; in addition the flowers are deep yellow to black-purple even in the same species; peduncles decumbent at base mostly; leaves mostly twice as large as in the other group; exceptions are A. Rosei, which has vertical tuberous roots like the other group, and the leaves of this and C. basalticus are even smaller than that group and less divided; C. basalticus is half way between the groups; in the wings the variance is remarkable. A. Panamintense has at times the cross section of the wings at base, triangular, then above that it is filiform, then enlarges again to as thick as the base, and then tapers quickly to a knife edge at the outer edge just as in Cymopterus proper in C. glomeratus, but the transition is more gradual. (See fig. 53 C. & R.) A. purpureum has the cross section filiform subulate about as in fig. 52 C. & R. A. Jonesii has the base of the cross section triangular to deltoid then abruptly filiform to the edge. A. Rosei is about the same; the habit of this group is different; all grow in the juniper life zone in rocky soil on well-drained ridges free from alkali, mostly among the junipers. I would put this group as a section of Cymopterus and call it Coriophyllus, excluding C. Panamintensis and taking C. purpureus as the type.

Cymopterus lapidosus var. deserti n. var.

This has the roots thick and often much enlarged and short, fleshy and rather glaucous leaves with very broad and flat petioles and rachis, the petioles rarely an inch long, blade broad and compact, most of the peduncles much shorter than the leaves, fruit with wings barely a third the width of the body, 3 lines long and 1½ lines wide, elliptical, most of them aborting, dorsal wings mostly aborted. This is the plant referred to by Coulter & Rose from Granger and this is the type of the variety. I also have it from Carter on the same date, and Nelson sends it under the name of C. Ibapensis No. 4575 from the same region at Piedmont. The habitat of this variety is very different from that of the type species, being clay flats like C. Ibapensis. Comparing this with the latter, I find the same tendency to the abortion of the dorsal ribs in Ibapensi, but never so marked. This clears the genus from one more puzzle.

Cymopterus Humboldtensis n. sp.

This belongs to the Pseudocymopterus section. Alpine, with the general habit and appearance of C. alpinus; leaves bright green, not at all glaucous, about 2 inches long, ternate, the divisions long-stalked and then pinnate below with the pinnae incised nearly to the midrib, the ultimate divisions being obovate, triangular acute and about ½ line long and smooth but rigid and acicular tipped as in the group, leaves flat on the ground, petioles variable not as long as the sheath and channeled; peduncles slender, ascending, 3-5 inches long, bearing a capitate umbel with 3-5 rays a line or two long or almost none; no involucres; involucels linear-subulate, about three times as long as the pedicels, that is about 3 lines long, weak, hyaline margined, distinct; pedicels about a line long, stout, angled and erect; fruit including the wings broadly oblong or oval, 3 lines long, the body 1 line wide, wings ½ line wide, the commissure flat when there are two seeds and with 10 thread-like oil tubes, the face convex and with two prominent ridges where the two or three dorsal wings arise, making the intervals channels, oil tubes about 5 in the intervals and very fine; wings corky, widest in the middle, the dorsal ones nearly as wide as the lateral, cross section broadly linear to the middle and then subulate to the edge, fruit with wings a little emarginate at both ends, straight. This is a delicate little alpine plant with deep and tapering root crowned

by a mat 2-4 inches wide scarcely rising above the ground except the peduncles, and growing in rocky talus along with Carex, Poa, and Astragalus. Gathered in the East Humboldt mountains, Nev., at about 11,000 feet alt., above Clover Valley, Aug. 2nd, 1901. I searched in vain for C. nivalis Watson there, but it was collected farther south in the range opposite Ruby Valley. Comparing this with specimens of the true C. albiflorus from Yellowstone Park, the seeds are almost identical as well as the involucels, but the leaves, erect habit and long rays are very different.

Cymopterus aboriginum n. sp.

Densely caespitose in clumps a foot or two across in the clefts of rocks, the crowns an inch or more thick with the densely clustered old leaf-petioles concealing the short sheaths, the crowns sometimes half a foot long and covered throughout with these sheaths, then much branched with many subsidiary crowns, but all concealed in a broad top from which arise several to many acaulescent rather slender peduncles a foot or less long; leaves with petioles often as long as the blades, the whole 4-8 inches long long, very scabrous, outline narrowly lanceolate, tri-pinnate, final segments oblanceolate, 1-3 lines long; flowers many, white, in loose heads, with several stout rays about 3 lines long and filiform pedicels as long; involucres none or a rudimentary purplish and hyaline collar, involucels of several filiform weak bracts fully as long as the pedicels which are sometimes purplish and a trifle united below into a rudimentary collar; in fruit the rays and pedicels elongate in the type to 6 lines long and the rays are nearly equal; fruit in the type oblately orbicular, 3 lines long, deeply emarginate at both ends, the body 1 line wide, with 8 oil tubes on the commissure and about 3 in the intervals, cross section fish-hook-shaped one lateral wing appearing as if on the inner face, lateral wings about 1½ lines wide, corky about the same width throughout, cross section linear with a narrow area in the middle, dorsal wings about as wide as the lateral, all three developed. Indian Spring Charleston mountains, Nevada, May 7th, 1906, in the Tropical Life Zone near its upper edge, 4000 feet alt.

Cymopterus aboriginum var. ovalis n. var.

Fruit oval, 3 lines long, the body about ¾ line wide and scarcely half the width of the wings, which are all equally developed and with cross section occasionally with a triangular

insertion; rays fully developed and about 1½ inches long, and filiform pedicels 4 lines long. Bishop, California, May 15, 1897, in the Lower Temperate Life Zone.

Cymopterus aboriginum var. subternatus n. var.

Like the variety ovalis, but leaves rather ternate than pinnate, and therefore deltoid in outline, final segments oblong-oblanceolate, about 1 line long; fruit nearly orbicular. I would not hesitate to call this a good species if there were not intergrades. Collected at the same time and place as the variety.

Cymopterus aboriginum var. oblongus n. var.

Like the type, but final divisions of leaves linear, 2-3 lines long; fruit oblong, about 5 lines long and 2½ lines wide, the body linear and about ½ line wide, and about half as wide as the lateral wings, which are almost always more developed than the dorsal, cross section of wings linear throughout. This appears very different from the type, but both grew near together in the same locality and have the same peculiar seed face. For years these forms have lain in my herbarium under the name of C. cinerarius, but it is evident that they are not that species.

An instance of the viciousness of the Brittonian code under which they have been compelled to train is found in the treatment Coulter and Rose give of Cymopterus purpurasceus, and all on the account of one obscure varietal name. I published Cymopterus Utahensis and its varieties monocephalus and Eastwoodae, and C. purpurascens, which will stand as the proper names of these species and varieties. Coulter and Rose, in spite of the description in Bot. Ives and on the strength of a single specimen which may or may not be the type of the variety change the names of all four in transferring them to Phellopterus, though the Vienna rules require that they should not be changed.

Leaving Pteryxia and taking up the other species of Cymopterus, two courses are open to the investigator; the Grayian and the Rosean. The former recognizes the difficulties of arrangement, but follows the genetic relationship (always a safe guide) and groups them all under Cymopterus. The latter method ignores the genetic relationship and arranges the species under four genera, thereby increasing the confusion three fold or more, for when under Cymopterus the difficulties can readily be understood by following the genetic relationship as shown by structure and ecological conditions

of growth, but under four genera one of them Oreoxys is placed far out of its place and the relationship of the species would not be suspected. In addition to this C. bipinnatus and C. alpinus are congeneric, but placed in separate genera, and are closely related species, as will be readily seen by comparing the fruit; even the figures given by Coulter and Rose will show it, as fig. 74 in the old monograph and fig 46 in the new monograph. Again, Thaspium montanum and Cymopetrus lapidosus are congeneric, though they are placed in seperate genera, while T. montanum and C. anisatus are kept in the same genus though still less related, the latter through C. bipinnatus, its structure (except the wings) and habitat being congeneric with Oreoxis. On comparing the figures of Rhysopterus and the fruit of Oreoxis alpina a remarkable similarity will be seen, but the species are widely separate in other respects; the corrugation of the wings amounts to little, as it is also common in most of the groups of Cymopterus as C. terebinthinus, C. anisatus, glomeratus, globosus, etc., but had they known C. globosus in its development they would hardly have erected the genus Rhysopterus, unless the type species which I have not seen differs most remarkably from the other two species whose types are in my herbarium. See remarks above on Cymopterus corrugatus. It should be stated in reference to Cymopterus globosus that the relative width of wings at tip and base seems greatly different, but a close study of C. corrugatus and its variety show the same peculiarity to a less degree. Rhysopterus Jonesii is given as having primary divisions of leaves three and of corrugatus as five, but this is not true of all the type specimens, though it is the prevailing characteristic. my recent collections show all sorts of intergrades. Neither of my two species show any such wings, as they give R. plurijugus, though they say P. Jonesii differs from it in no respect but trivial characteristics such as thickness of leaves. longer peduncle, etc. Coulter and Rose have seen but very little material of P. Jonesii, while I have at least twenty specimens of it. The same is true of C. corrugatus, and in addition I have it from four localities, while they have seen but little of it, and that from one locality. The peculiarly cleft bracts hold only in the type specimens of C. corrugatus, while in other specimens both occur on the same plant, though the entire ones predominate. The type of Rhysopterus is figured as having seven ribs equally prominent, but C. corrguatus has

only rudimentary ones where there is but one seed to a flower, and I cannot find any on P. Jonesii, while I do find ribs on both that are so thin as to have the cross section filiform as is the common case in Cymopteri, while other ribs, especially the lateral ones, are very thick, but never blunt as figured for Rhysopterus.

I should place Rhysopterus (C. & R.) as the first section of Cymopterus and embracing the following species C. corrugatus and its variety Coulteri, **C. plurijugus** (Rhysopterus plurijugus C. & R. Umb. 186 (1900), C. globosus. Its sectional character includes the small elliptical fruit with narrow, thick and corrugated wings, especially the later ones narrowing below, the extra pair on the commissure either developed or rudimentary (in C. globosus), the white flowers, absence of involucre, many involucels with hyaline margins and rather broad, very short pedicels, umbels with simple rays bearing several flowered small heads, short ascending peduncles shorter than the leaves, leaves leathery, but not rigid, sparingly divided, glaucous, rosulate, flat on the ground, short and scarcely elongating slender foot clothed with non-fibrous hyaline leaf sheaths without petioles and arising from an erect enlarged and tuberous root (as in Phellopterus), and growing on low lands in the Lower Temperate Life Zone.

Next to Rhysopterus comes Phellopterus Nutt., embracing C. montanus, and its variety pedunculatus, C. Utahensis and its varieties Eastwoodae and monocephalus without rays (which includes C. bulbosus), and C. purpurascens. This group is characterized by white (rarely purplish flowers, large hyaline and connate involucres and involucels, pedicels shorter than the fruit, rays conspicuous; fruit 4-6 lines long, with very broad and thin wings widest next to the seed, the dorsal ones all developed and not corrugated; in roots, foot, leaf sheaths and leaves like Rhysopterus, though leaves more dissected. This group should also contain as a sub-group C. longipes, C. glaucus, **C. Watsoni** (Aulospermum Watsoni C. & R. Umb. 176 (1900), C. Ibapensis, C. lapidosus. This differs from the main group in having the elongating foot and small oblong seeds about 3-4 lines long. This division is Aulospermum C. & R. and therefore a synonym.

Next to Phellopterus comes Eucymopterus T. & G., embracing C. glomeratus and its varieties **Parryi** (C. Parryi C. & R. Rev. Umb. 50 1888), and **Leibergii** (C. Leibergii C. & R.

Umb. 182 1900), C. Fendleri and its variety Newberryi, and C. megacephalus. This has the same character as Rhysopterus, except that the leaf sheaths are inclined to be a little fibrous, noticeably so in C. megacephalus (rays also absent in this species), leaves more divided and less glaucous as rule, pedicels almost none, flowers mostly white, fruit oval to obovate, 3-4 lines long, with lateral wings always developed and usually at least one dorsal and as wide or wider than the body, the wing consisting of a thickened area at or near the middle of its cross-section, which is connected with the body of the seed by a very thin section, the outer end of the cross section tapering abruptly or gradually to a thin edge; this gives the seed an appearance of being surrounded by a thickened ring, in C. glomeratus the wings are often corrugated almost as much as in C. corrugatus.

The above three groups form a natural division of the genus characterized by the tuberous and erect roots, rosulate leaves which are leathery but not rigid nor aculeate tipped, acaulescent, and growing on low lands or mesas, not among solid rocks, in the Lower Temperate Life Zone mostly.

Cymopterus Owenensis n. sp.

Allied to C. Jonesii. Smooth throughout; acaulescent and caespitose; leaves coriaceous and rigid, ternate and then pinnate and with the large ovate leaflets incisely 3-5-lobed and covered with sharp, short and deltoid teeth, petioles short, margined for half their length with the abruptly enlarged hyaline sheaths, purplish as well as the peduncles; peduncles 4-6 inches long, ascending, stout; involucre none; involucels a hyaline collar very small and a few lanceolate hyaline-margined small bracts; flowering pedicels about 1 line long, many; rays about equal, 1 inch long and about 10, stout; very immature fruit with conspicuous wings; evidently with large fruit wings when mature; if it were not for the evident wings this would be taken for a Peucedanum of the Euryptera section. Lone Pine, California, Owen's Valley, May 14th, 1897, high up on the sides of Mt. Whitney, in loose soil among the pines.

The following groups embrace the rest of the genus which division is characterized by dense clusters of fibrous mostly short leaf sheaths mostly with old and woody petioles, caespitose stems (less so in Rosei and basalticus), from deep and long rarely fleshy roots, much branched crowns with short

stems mostly concealed by the leaf sheaths, leaves rigid and nearly always aculeate tipped, and generally finely dissected, mostly large and densely tufted plants a foot or two high, but some alpine and small, nearly evenly distributed between four life zones.

The first section is **Scopulicola**, embracing C. basalticus, **C. Rosei** (Aulospermum Rosei Jones C. & R. Umb. 179 1900), C. Owenensis, C. Jonesii, C. purpureus. This group connects directly with Phellopterus through the first species and with Pteryxia through the latter species and C. Panamintensis. It is characterized by the few and small crowns and few leaf-sheaths, being nearly acaulescent, peduncles decumbent at base, leaves flat on the ground, feet elongated but not rising above the ground, from a deep and tuberous mostly horizontal root which is simple or few branched, flowers yellow or black-purple, involucres none, involucels of small bractlets about 2 lines long or less and mostly distinct, fruit about orbicular, about 3-4 lines long, emarginate at both ends when mature, with very broad wings fully developed on the face, cross section of wings triangular to deltoid at seed, but thin beyond or subulate, rays evident and mostly stout and short, raylets none to 2 lines long; leaves broad, pinnate to bipinnate or bi-ternate with final divisions large and variously incised or toothed with triangular to very broad and short apiculate teeth, never with linear lobes, coarse and very rigid, but not large leaves. The species grow in the Lower Temperate Life Zone, mostly where the soil is thin and underlaid by rocks, and among rocks but not on cliffs or in the crevices of rocks, to speak of.

The second section of this division is Pteryxia Nutt., embracing C. Panamintensis, C. cinerarius, C. aboriginum and its varieties, C. terebinthinus, C. foeniculaceus, C. calcareus, **C. Californicus** (Pteryxia Californica C. & R. Umb. 172, 1900), (which is doubtfully distinct from C. calcareus), C. albiflorus, C. thapsoides and C. petraeus. This group is characterized by having caespitose woody roots with very thick crowns densely clad with old and short and fibrous leaf sheaths and dead petioles forming a dense mass; roots apparently not tuberous, though rarely fleshy and always branched, usually going down indefinitely or spreading out in the crevices, but never fibrous; leaves erect or ascending and many at the crown, rigid, leathery, and aculeate tipped, finely dissected into minute

and narrow segments, leaf sheaths 3-4 times shorter than the petioles which are shorter than the blades, the whole sometimes a foot long; peduncles longer than the leaves, erect and rather stout; stems an inch or two to a foot long, straggling upward; involucres none; involucels of linear to subulate long bracts; rays unequal 1-3 inches long, rather many; raylets not longer than the seeds when mature; flowers light yellow to white; fruit mostly oblong in outline rarely oval, 3-4 lines long, dorsal wings gradually reduced from nearly equal to the lateral ones to mere rudiments in the latter species; cross section of the wings nearly filiform, sometimes wider at base and subulate and sometimes a knife edge next the seed and a trifle wider above, edge sharp. Middle and Lower Temperate Life Zones growing in the crevices of rocks. The latter species in this group show the same approach to Peucedanum that the alatum group of Peucedanum shows to Cymopterus, though each belongs to its genus in most respects. It is a curious fact that Peucedanum Parryi grows along with or near Cymopterus calcareus where the Peucedanoid Cymopterus petraeus grows, and Peucedanum triternatum and simplex grow along with or near Cymopterus foeniculaceus where the Cymopteroid Peucedanum anomalum grows, but I have never seen anything that could be called a hybrid, as the differences are solely in the fruit.

The next section of this division is **Oreoxis** (Raf. Ser. Bull. Bot. 1 217 (1830) as genus), embracing C. Humboldtianus, C. anisatus, C. bipinnatus, C. alpinus (which includes Oreoxis humilis), **C. Bakeri** (Oreoxis Bakeri C. & R. Umb. 144, 1900), if that be a good species, which I very much doubt; O. Hendersoni is evidently a form of anisatus. This group resembles Pteryxia in many respects, but it is acaulescent and with slender, non-fibrous or fleshy roots, it has the same kind of crowns, crowded leaf sheaths and petioles and caespitose habit, but leaves narrow and pinnately decompound into minute or linear segments and apiculate, leaves ascending, small and rigid: it has the same rather rigid linear bracts, but rays often short and pedicels scarcely any or shorter than the seeds, which are not over 2 lines long; wings narrower than the seeds and obtuse edged, mostly thickest next the seed, variously aborted on the face; peduncles longer than the leaves and nearly erect; alpine or subalpine plants growing in gravel or sometimes as in C. anisatus in the crevices

of rocks.

The next and last section of this division is **Pseudocymopterus** (C. & R., Rev. Umb. 74 (1888) as genus), but restricted to the first species so far as their limitation went. It embraces **C. ligusticoides** (Thaspium montanum Gray Pl Fend. 57, 1849). It approaches Peucedanum very closely, but the fruit and the habit is much like Ligusticum. Peucedanum Kingii has the leaves of some forms of the former and the winged dorsal ribs of the latter, at times, P. juniperinum shows the same thing also, alatum and anomalum also show similar characteristics. This group is characterized by erect and slender stems an inch to a foot or two long, from an erect tuberous-enlarged fleshy root, with few rather small crowns covered with few rather large and somewhat fibrous leaf-sheaths and very few dead petioles; leaves not fleshy nor leathery, rather thin, mostly pinnately decompound into small or linear apiculate segments, on short petioles; involucres absent and involucels of filiform to linear elongated bracts; fruit about 2-3 lines long, nearly oval, with lateral wings not as wide as the body, but obtuse edged as are those on the back, thin, cross section either linear or a trifle wider at insertion and sometimes reduced to a knife-edge just above the insertion and wider above, forming a scarcely noticeable ring, dorsal wings either half as wide as the lateral or reduced to raised ribs, and then inseparable from Peucedanum, commisural side either flat or concave. The other form of **C. ligusticoides** is **variety tenuifolius** (Thaspium montanum var. tenuifolium Grav Pl. Wr. 2 65, 1853).

Peucedanum. Taking up this genus, Coulter and Rose in their last revision relegate this to synonymy as to North American plants and resurrect the name of Rafinesque, Lomatium, an untenable name, as there is another Lomatia. To disturb such a large genus as this certainly ought to require important reasons. They state that the type of Peucedanum is P. officinale L. Sp. Pl. 245, but this is not true, since the types of Peucedanum are P. officinale, P. alpestre, P. Silaue, and P. nodosum. Any one of these species is as much the type of Peucedanum as the other as Linnaeus made no preference. Drude in his revision of the genera of the Umbelliferae for the Pflanzenfamilien, and to whom were accessible all the European species, refers P. officinale, macrocarpum, utriculatum, leiocarpum, triternatum to the same section Cervaria, under

the division Eupeucedanum. They (Coulter and Rose) also state that our Peucedana are "xerophytic plants of acaulescent habit belonging to the arid regions of western America," which is only partially true. Out of 58 species enumerated, 20 do not grow in arid regions at all. Some grow in meadows and are mesophytic; some of them are conspicuously caulescent, though the majority are subacaulescent; very few are strictly acaulescent. Very few indeed are any more xerophytic than Erigenia, since most of the species of our Peucedana have tuberous roots and develop as I have seen many times when the ground was either flooded with water or so wet as to be muddy, and at a time when the relative humidity was almost at saturation. To call such plants xerophytic is a misnomer, for plants must be all classed ecologically according to the climate in which they develop, and not according to the climate when they are at rest. In their use of the term arid I assume that they mean ecologically arid and not geographically arid, for if they mean the latter then their remark has no significance at all. For to call the upper slopes of our mountains arid where our most gorgeous flora abounds is absurd, though they are surrounded thousands of feet below by arid plains. Their climate closely approaches that of Europe. In examining the various species of Peucedanum which constitute the type of the genus we find that most of them belong to a well-defined group of which P. officinale is a fair representative. This group approaches Sium more closely than our Peucedana do, even our forms which Coulter and Rose have referred to Cynomarathrum are less related than they. But when we come to other species referred to this genus later than the time of Linnaeus there is no doubt that Europe contains some species that are congeneric with ours, P. Alsaticum, for instance. There are very few species of our Peucedana that are so deficient in wings as the Peucedana of Linnaeus, while the Orogenioid forms only approach them in the leaves, but not the habit. On the whole it seems to be well established that our Peucedana are distinct from those of Linneaus, though not so from some European Peucedana. They must therefore bear a new name, as Lomatium of Rafinesque is untenable. This name is Cogswellia Spreng (1820).

Cervaria Minuart Gaertn. Fruct, 1788, was founded on Peucedanum Cervaria L., and to this genus is referred P. Alsaticum, which seems to be congeneric with ours, but I doubt

that it belongs to Cervaria.

The arrangement of Drude in the Pflanzenfamilien is manifestly not a good one, as P. officinale, macrocarpum and triternatum have very little in common, and therefore Coulter and Rose did well in ignoring it.

Coulter and Rose give as one of the distinctions between Leptotaenia and Peucedanum the absence of a longitudinal ridge in the latter. I have not yet found a Peucedanum that did not have such a ridge.

Arranging the species of Cogswellia in the genetic order as far as a linear arrangement can do it, I would divide them up as follows:

Section **Euryptera** (Nutt., Torr. & Gray Fl. N. A. 1 629 (1840) as genus). This and the following are Leptotaenioid sections. It is characterized by caespitose stems from a woody and fleshy root branching below, rigid acerose-tipped leaves with few and broad divisions after the fashion of Cymopterus section Scopulicola; fruit very broad, almost round, and with thick blunt-edged wings as wide or wider than the body; commissural ridge evident; fruit deeply notched at both ends; dorsal ribs very low or almost obsolete; tips of peduncles and rays tumid. This section includes **C. lucida** (Nutt. T. & G. Fl. 1 348, (1840), as Euryptera), **C. Hassei** (C. & R. Bot. Gaz. 14 276 (1889), as Peucedanum); this hardly deserves specific rank; **C. pallida** (C. & R. Umb. 242, (1900) as Euryptera), **C. Howellii** (Watson Proc. Am. Acad. 20 369, (1885) as Peucedanum),**C. insularis** (Eastwood Proc. Cal. Acad, III I 106 pl. 8, (1898) as Peucedanum).

The second section of Cogswellia is **Crassipedunculata** characterized by single to few crowns from a slender, erect, simple and fleshy root, nearly acaulescent; leaves with large, pale, beautifully veined, smooth leaflets toothed only above, leathery; pedunclés greatly swollen and white at top and rays somewhat so; fruit Leptotaenioid, elliptical, not emarginate, with narrow and obtuse-edged wings, and fine and low ribs, and faint commissural ridge. This includes **C. nudicaulis** (Pursh Fl. 1 196 (1814) as Smyrnium), and **C. latifolia** (Nutt. T. & G. Fl. 1 625 (1840) as Peucedanum).

The third section of Cogswellia is **Lonchophylla** with single to few crowns from a slender and elongated but fleshy and simple and erect root; leaves ternately divided into linear to filiform, leathery but not rigid, elongated, often pubescent,

mostly acute leaflets, seldom less than an inch long; peduncles not noticeably swollen at tip; rays elongated and unequal; pedicels not as long as the fruit; ribs conspicuous, deltoid in cross section or sometimes winged; lateral wings thin but blunt edged, mostly nearly as broad as the body; commissural ridge evident; fruit narrowly to broadly oblong; seeds much flattened; generally tall plants and caulescent, and flowers mostly yellow. This includes **C. Cusickii** (Watson Proc. Am. Acad. 21 453 (1886) as Peucedanum), **C. laevigata** (Nutt. T. & G. Fl. 1 627 (1840) as Peucedanum), a doubtful species; **C. brevifolia** (C. & R. Rev. Umb. 70 (1888) as Peucedanum triternatum var.), **C. triternata** (Pursh Fl. 1 197 (1814) as Seseli), which includes the var. **alata**, which is only a form: **C. triternata var. robustior** (C. & R. Cont. Nat. Herb. 3 228 (1895) as Peucedanum), **C. anomala** (Jones C. & R. Umb. 237 (1900) as Lomatium), **C. platycarpa** (Torr. Stansby. Rep. 389 (1852) as Peucedanum triternatum var.), **C. Suksdorfii** (Watson Proc. Am. Acad. 20 369 (1885) as Peucedanum), **C. gigantea** (C. & R. Umb. 240 (1900) as Lomatium) **C. brecciarum, C. Brandegei** (C. & R. Bot. Gaz. 13, 210 (1888) as Peucedanum).

The fourth section of Cogswellia is **Cynomarathrum** (Nutt. C. & R. Umb. 244 (1900) as genus). This is characterized by caespitose, woody and fleshy roots, branching below; crowns densely clad with fibrous and dead leaf sheaths and old woody petioles; acaulescent, with rigid stems and leaves, the latter with acerose tips, coriaceous, pinnately divided into distant and linear lobes or pinnae not wider than the petioles, light-green, narrow, with long petioles and very short leaf sheaths; rays nearly equal, at least the fertile ones; pedicels mostly as long or longer than the fruit; whole plant smooth; fruit oblong to elliptical, with narrow lateral wings with blunt edges, dorsal ribs conspicuous and the two outside ones often winged, but wings not nearly as wide as the lateral ones. This includes **C. Nuttallii** (Gray Proc. Am. Acad. 8 287 (1870) as Seseli), and the **variety alpina** (Watson Bot. King 129 (1871) as Peucedanum graveolens var.), **C. Parryi** (Watson Proc. Am. Acad. 11 143 (1876) as Peucedanum).

The fifth section of Cogswellia is **Cous.** This is characterized by the roots being a tuber or a string of tubers mostly round and with a slender prolongation below; weak and delicate peduncles and leaves; leaflets linear to filiform (short

and broader in Canbyi); fruit narrow to elliptical and with wings not wider than body, mostly 2-3 lines long, back more convex, but wings thin, ribs prominent. This includes **C. ambigua** (Nutt. Jour. Phil. Acad. 7 27 (1834) as Eulophus), **C. leptocarpa** (Nutt. T. & G. Fl. 1 626 (1840) as Peucedanum triternatum var.), **C. bicolor** (Watson Bot. King 129 (1871) as Peucedanum), **C. orogenioides** (Leibergia orogenioides, C. & R.), **C. circumdata** (Watson Proc. A. Acad. 22 474 (1887) as Peucedanum), **C. Cous** (Watson Proc. Am. Acad. 21 453 (1886) as Peucedanum),**C. Watsoni** (C. & R. Bot. Gaz. 13 209 (1888) as Peucedanum). All these have yellow flowers. The white flowered forms are **C. Canbyi** (C. & R. Bot. Gaz. 13 78 (1888) as Peucedanum), **C. Hendersoni** (C. & R. Bot. Gaz. 13 210 (1888) as Peucedanum), **C. Piperi** C. & R. Umb. 211 (1900) as Lomatium), **C. farinosa** (Hooker Lond. Jour. Bot. 6 235 (1847) as Peucedanum), **C. Geyeri** (Watson Proc. Am. Acad. 14 293 (1879) as Peucedanum), **C. Gormani** (Howell Fl. 252 (1898) as Peucedanum). Plants of the Middle Temperate Life Zone.

The sixth section of Cogswellia is **Campicola.** This is characterized by large and globose tubers at the ends of long and erect roots or fusiform tubers nearer the surface; acaulescent or nearly so; leaves minutely pubescent, broad, pinnately or subternately dissected into rather coarse segments which are inclined to be oblong or narrower, but not linear; petioles thick, mostly flattened and short and rachis flattened, leaves appearing as if glaucous; fruit elliptical to oblong, inclined to be ovate, wings rarely as wide as body; flowers white or turning purplish. This includes **C. Nevadensis** (Watson Proc. Am. Acad. 11 143 (1876) as Peucedanum) and its varieties **cupulata** (Jones Cont. 8 29 (1898) as Peucedanum), **var. Parishii** (C. & R. Bot. Gaz. 13 209 (1888) as Peucedanum), and **var. pseudorientalis, C. Lemmoni** (C. & R. Bot. Gaz. 14 277 (1889) as Peucedanum) probably. All these have large and deep-seated globose tubers rarely collected, most specimens have only the elongated fleshy root above the tuber. The other species with large oblong or fusiform tubers are **C. orientalis** (C. & R. Umb. 220 (1900) as Lomatium), **C. macrocarpa** (Nutt. T. & G. Fl. 1 627 (1840) as Peucedanum), **C. elliptica** (T. & G. Pac. R. R. Rep. 2 2 121 (1855) as Peucedanum nudicaule var.) if this be a good species. This group grows on the plains and table lands in the Lower and Middle Tem-

perate Life Zones.

This may include **C. Congdoni** (C. & R. Umb. 232 (1900) as Lomatium) and **C. Plummerae** (C. & R. Bot. Gaz. 14 278 (1889) as Peucedanum), but the latter has smooth and very finely dissected leaves.

The seventh section of Cogswellia is **Eucogswellia.** This embraces the bulk of the North American Peucedana and is characterized by the leaves being without evidently flattened petioles or rachis; elongated, tuberous or woody thickened and branching roots; mostly much dissected leaves with fine or short segments; flowers light to deep yellow, rarely if ever white, occasionally black-purple, but in this case mostly yellow in the same species.

The first division of this section contains those species with few crowns from an elongated root which is mostly slender above and enlarges below into a fusiform and somewhat branched root and not woody, rarely if ever growing in the crevices of rocks, but mostly in loose gravel or talus on well-drained mesas or dry and stony ridges. The plants of the Middle Temperate Life Zone up to the alpine are **C. montana** (C. & R. Umb. 214 (1900) as Lomatium), **C. juniperina** (Jones Cont. 8 29 (1898) as Peucedanum),**C. Donnellii** (C. & R. Bot. Gaz. 13 143 (1888) as Peucedanum)**C. Sonnei** (C. & R. Umb. 236 (1900) as Lomatium), **C. Martindalei** (C. & R. Bot. Gaz. 13 142 (1888) as Peucedanum), **C. Martindalei var. angustata** (C. & R. Bot. Gaz. 13 143 (1888) as Peucedanum Martindalei var.), **C. vaginata** (C. & R. Umb. 223 (1900) as Lomatium). The forms growing in the Lower Temperate Life Zone are **C. viilosa** (Raf. Jour. Phys. 89 101 (1819) as Lomatium) Spreng. in Roem. & Schult. Syst. 6 588 (1820), **C. daucifolia** (Nutt. T. & G. Fl. I 627 (1840) as Peucedanum), **C. MacDougali** (C. & R. Umb. 233 (1900) as Lomatium), **C. Jonesii** (C. & R. Umb. 233 (1900) as Lomatium (a well-marked species and the most common one but I doubt its distinctness from C. MacDaugali. it must take the name as it precedes it), **C. decipiens, C. Mohavensis** (C. & R. Rev. Umb. 62 (1888) as Peucedanum) which also includes Peucedanum Argense Jones. The Tropical Life Zone forms and those farther north along the Coast are confined to the region west of the Sierras and are **C. utriculata** (Nutt. T. & G. Fl. 1 628 (1840) as Peucedanum), **C. caruifolia** (H. & A. Bot. Beech. 348 (1840) as Peucedanum), **C. dasycarpa** (T. & G. Fl. 1 628 (1840)

as Peucedanum), **C. tomentosa** (Benth. Pl. Hartw. 312 (1849) as Peucedanum), **C. marginata** (Benth Pl. Hartw. 312 (1849) as Peucedanum) a doubtful species.

The second division of this section has those with caespitose and mostly woody roots but thickened and somewhat fleshy and branched below; plants nearly always growing among cliffs in the clefts of rocks; leaves mostly rather rigid, ultimate segments sharp. The high alpine forms are **C. Oregana** (C. & R. Rev. Umb. 64 (1888) as Peucedanum), **C. Hallii** (Watson Proc. Am. Acad. 11 141 (1876) as Peucedanum), **C. Austinae** (C. & R. Bot. Gaz. 13, 208 (1888) as Peucedanum), is subalpine, **C. Leibergii** (C. & R. Umb. 224 (1900) as Lomatium), **C. Sandbergii** (C. & R. Bot. Gaz. 13 79 (1888) as Peucedanum), **C. Congdoni** (C. & R. Umb. 232 (1900) as Lomatium) and **C. Plummerae** (C. & R. 232 (1900) as Lomatium) may come here. The low altitude forms of the Lower Temperate and Tropical Life Zones are **C. microcarpa** (Howell C. & R. Rev. Umb. 65 (1888) as Peucedanum), **C. millefolia** (Watson Bot. King 129 (1871) as Peucedanum), **C. Torreyi** (C. & R. Bot. Gaz. 14 276 (1889) as Peucedanuc), **C. Eastwoodae** (C. & R. Umb. 247 (1900) as Cynomarathrum), **C. scabra** (C. & R. Umb. 247 (1900) as Cynomarathrum).

Cynomarathrum Nuttall Coulter and Rose consider to be a good genus but how they can separate it from the Cusickii-triternatum group they would have much difficulty in explaining. They say it differs from Lomatium 'in the more winged dorsal and intermediate ribs" when L. alatum is fully as much winged while anomalum has ribs three or four times as much winged. They say it differs in its habit and yet they would have a hard time telling in what the habit differs from that of C. Cusickii or the triternatum group except that the one grows among rocks and the other in crevices. It is true the leaves are pinnate but so are those of Hallii, Oreganum and Leibergii. In Nuttallii the seed face is not so flat as in triternatum. The Eastwoodae section gradually passes into the utriculatum section on the one hand and through Parryi into the Nuttallii section, but they do not differ from either as much as bicolor does from utriculatum, and still less from the foeniculaceum or Mohavense section. Taking up Euryptera they also make that a genus and yet it differs less from the leiocarpum section than that does from the true Lomatia. It is manifestly a close congener. To separate these groups into

separate genera destroys the whole genetic balance. To keep them in one large genus preserves that balance and enables any student to see at a glance the relationship of the groups which is one of the prime requisites of systematic botany. True it spoils the chance to make a set of new combinations with one's name as the botanical tail to them which I consider a misfortune even when necessary as is the case with Lomatium. The only character that would separate Cynomarathrum from Lomatium they destroy in admitting C. Brandegei in the genus with ternate and not pinnate leaves.

Cogswellia montana (C. & R.)

Roots very fleshy, erect and elongated, sometimes an inch thick, mostly single and tapering above, and below producing several narrow lateral rootlets which sometimes enlarge into small fusiform tubers, and at base with more or less large and tapering branches; crowns small, narrow and elongated, of one to few, loose, stout peduncles surrounded by few very long and purplish hyaline leaf sheaths which are slightly fibrous with age: acaulescent; leaves ternate and then pinnate, the primary divisions all stalked, each division appearing bipinnate, the pinnae being ovate, 3-9 lines long, and then divided nearly to the midrib into oblong-oblanceolate and obtuse segments about 3-4 lines long, blades 3-4 inches long, the petioles either very short or even 6 inches long and gradually enlarging below into the very long and hyaline sheaths; whole plant glabrous and bright green, general outline of leaves ovate; involucres none; involucels many, broad, striate, hyaline-margined, reflexed, obovate to oblanceolate smooth bracts about 2-3 lines long; rays stout ½-3 inches long, several; pedicels not over 2 lines long, slender and erect or ascending; fruit 3-4 lines long and 1½-2 lines wide, elliptical, barely emarginate at both ends, wings about one-third the body and thin; oil tubes appearing as if one in the intervals and filling them but really about 2-3 and coalescing, appearing as if 2 on the commissure but really 6 and sinuous; dorsal ribs raised and sharp and at least one of them generally raised and wing-like but never over ¼ the width of the laterals. High alpine on Mt. Bridger, Montana, Aug. 10, 1906. This plant is manifestly a congener to C. juniperina and certainly does not belong to the farinosa group where Coulter and Rose placed it, though it is a close relative of what they have named C. Cous and C. circumdatum which both have the same winged

dorsal ribs connecting with Cymopterus, and differ from the farinosa group in the roots.

Cogswellia brecciarum n. sp.

Leaves biternate, leaflets 1-2 inches long, tapering at both ends and apiculate, smooth as is the whole plant, narrowly linear, thin, petioles evident, the root ones long, leaf sheaths narrow and short; plants caespitose from an erect, slender but fleshy root branched at the top; crowns thick with many fibrous old leaf sheaths, also with a few leafless longer ones which are hyaline and fresh; proper stems a few inches high and with a node or two, filiform, erect; peduncles filiform, 2-4 inches long; rays few and very unequal, the longest not over an inch; pedicels not over 2 lines long, erect; involucres none; involucels setaceous and short; immature fruit about 5 lines long, oblanceolate, with narrow and thick lateral wings not over one-third the body, apparently 2 oil tubes in the intervals and rather sharp and raised ribs. Apparently a close congener to C. Brandegei, but differing widely in the leaves, and belonging to the Nuttallii class. High alpine on Mt. Haggin, Montana, Aug. 3rd, 1905, growing on ridges in loose breccia. Flowers at first greenish-yellow then purplish-white.

Cogswellia Nevadensis var. Parishii (C. & R. Bot. Gaz. 13, 209 (1888) as Peucedanum). This has caused me a great deal of trouble and at last it is evident that it cannot be maintained as a species. I have it in quantity from many localities and have complete transitions from C. Nevadensis with the large and hyaline bracts to the almost filiform and narrow ones that are more typical of the type species. The variety is more common southward extending into Arizona and southern Utah and eastward as far as Marysvale. The leaves are often biternate only and with leaflets an inch long.

C. Nevadensis var. pseudorientalis n. var.

This has the cupulate large involucels of the **variety cupulata** (Jones Cont. 8, 28 (1898) as Peucedanum Nevadense var. cupulatum), smooth seeds and pedicels, and dorsal intervals with single oil tubes in the middle and double on the sides. This grows side by side with normal C. Nevadensis with smooth seeds and pedicels and four oil tubes in the intervals. It also passes imperceptibly into the forms with narrow bracts of the Parishii class. The type is from Skull Valley, northwestern Arizona, May 1st, 1903, 4,300 feet alt., in rather clayey soil on a volcanic slope. Associated with it

are specimens from Chloride, the Hualapai Mts. and the Grand Canon all gathered in May or late April of the same year. Intergrading material comes from the same localities. Intergrades with smooth pods, small bracts and several oil tubes come from Pine south of Flagstaff, 1890, Pleasant Canon, Panamint Mts., Nevada, Skull Valley also. This variety is doubtless what Coulter and Rose have referred to C. orientalis from western Arizona. C. orientalis as represented in my herbarium has very small, distinct, nearly hyaline bracts, more glaucous leaves, and umbels in flower with nearly equal rays. It may pass into C. Nevadensis, but I have seen no intergrades.

Cogswellia Sonnei was gathered by me and distributed as a Peucedanum without name from Reno, Nevada, in 1882 as No. 3879. I have what seems to be the same thing from Shepherd Canon, Argus Mountains, California.

Cogswellia millefolia var. depauperata n. var.

Primary divisions of leaves with nearly linear pinnae which are dissected into minute linear segments, the leaves without petioles and very short, and pinnae remote; oil tubes 2 on the commissure. A very remarkable form and the most common one in the deserts. Dugway, Dutch Mountain, Granite Mountains, Cove Creek, Detroit, Fish Springs, etc., western Utah.

Cogswellia decipiens n. sp.

Caespitose and acaulescent from a thick and fleshy erect root; crowns several, narrow with a few somewhat fibrous dead sheaths and several leafless hyaline living ones about an inch long; whole plant except the fruit and pedicels rough hairy even to the sheaths; leaves without petioles (except the hyaline sheath, which is an inch long), ternate and then bipinnate, 2-3 inches long, the final segments oblong-oblanceolate and sharply apiculate, about 1-2 lines long; peduncles slender and flexuous, many, some shorter than the leaves and some much longer; umbels inclined to be one-sided, with one to few stout rays an inch or two long and several slender and shorter ones, but not proliferous; most of the flowers aborting, deep yellow and mixed with purple ones, very small; involucres occasionally present as a hyaline bract; involucels reduced to a hyaline and very minute collar, which sometimes is produced into a few subulate bracts, but very small; pedicels in flower very short, in fruit 1-3 lines long and stout; immature fruit 3 lines long, elliptical and with narrow wing,

erect. In habit and leaves it resembles the Nevadensis group, but the flowers and bracts and pubescence are of the Jonesii group. Hualapai Mountains, near Kingman, Arizona, April 23rd, 1903.

Leptotaenia anomala was gathered by me in 1882 at San Luis Obispo. It is likely that this will be found abundantly in the herbaria under Peucedanum caruifolium, as it differs only in the fruit. This is my No. 3600 referred to Peucedanum caruifolium by Coulter and Rose, Rev. Umb. 68.

Cusickia N. Gen.

This is what I suppose Coulter and Rose call Leptotaenia minor; at least it fits their description and was distributed by Cusick as such, probably having been identified by them. It is not, however, a Leptotaenia. The fruit is about 5 lines long and 2½ lines wide, oblong and with rounded ends, not emarginate, smooth, face evenly convex, without ribs, but with an almost uniform corky layer running from the sharp edge over the face to the other edge throughout and about ⅛ line thick; in this layer between the two skins are four large holes corresponding to the intervals and representing oil tubes, but empty, though dark-colored from the outside and looking like large and single oil tubes, the spaces between them look like very thick ribs, but are spongy like the rest of the layer; near the edge this layer is a trifle thicker, the spongy part or wing on the edge starting from the last hole is lenticular in cross section and ½ line wide; the commissural side is concave, without central rib, but with two wings about half way from the center to the side (one on each side(which are appressed outwardly about ½ line high very thin next the seed and then spongy-enlarged above, these wings have a filiform oil tube on the thin part on the outside; the commissural face of the seed has about three obscure oil tubes between the wings and two broad and obscure ones, or at least dark areas, next the wing of the seed, one on each side; flowers purple; involucels triangular-subulate, about as long as the pedicels, hyaline; involucres none; pedicels in fruit 2-4 lines long, stout; rays 1-2 inches long, very stout, nearly equal; peduncles a foot long and ½ inch thick, inflated; leaves fleshy, smooth, large, ternate and then tripinnate, the final segments lanceolate, acute, about 1 line long; petioles elongated and very stout, striate, those of the short stems not longer than the broad leaf-sheaths (1 foot long); roots thick and tuberous, branching below, large. This

is a most remarkable plant, not at all related to Leptotaenia. Dedicated to Wm. C. Cusick, one of the best and oldest of our collectors. **Cusickia minor n. sp.** character of genus.

Coulter and Rose have been careless in drawing up the generic character of Leptotaenia. They say "oil tubes 3-6 in the intervals," and yet nearly half their species do not have even three oil tubes in the intervals.

Leptctaenia multifida var. Eatoni (C. & R. Rev. Umb. 52 (1888) as species). This cannot be maintained as a species; it grades imperceptibly into the type species. The more dissected forms around farther north and in the Sierras, but intermingle.

Cogswellia bicolor is reported by me from Idaho by Coulter and Rose on page 237. This was an error of mine, as the plant is C. leptocarpa, which is its nearest congener. It has the same moniliform roots and the same peculiar habitat, but differs in the shorter fruit, and broader and with thicker wing and the peculiar filiform leaf divisions which are the only permanent distinctions. No. 2414 Cusick distributed as Leibergia crogenioides ? is nearer it, but still clearly C. leptocarpa. I have seen no typical specimens of this species out of Utah; all others are leptocarpa, which is a seemingly good species. Coulter and Rose are in error in placing it with C. anomala and the nudicaulis group. Though that is nearest related to the ambigua group, yet they have separated them by the whole width of the genus, the groups differ, however, in the roots. The utriculatum-caruifolium group Coulter and Rose have confused. My No. 3172, which they refer to utriculatum, is not utriculatum. It has the shape and wings of Vasevi and the oil tubes of caruifolium, there being at least three oil tubes in the intervals and none on the commissure. A specimen sent me as C. Vaseyi by Parish is identical with mine. Whether there are two species in this group I am not able to say, but there are certainly not three. I have abundant material of utriculatum from Vancouver Is. which seems to mark it as a distinct species, which is well characterized by Torrey and Gray, the fruit being 3 lines long and 2 lines wide, ovate-oval to oval-elliptic, wings wider below and about the width of body and much prolonged beyond the base of the seed and but very little above it; the oil tubes are large and single on the face and 4-6 on the commissure, the lateral ones being large and often coalescing, the leaves are

ternately and then pinnately decompound, very thin and delicate, caraway-like, the final divisions minute and filiform-oblanceolate, 1-2 lines long and flat; the stems are erect, or nearly so, and with about 3 nodes; the leaves like the rest of the group have no proper petiole, the much dilated sheath reaching to the blade; it is a slender plant with slender rays very unequal, the longest not over 3 inches long; the raylets or pedicels are not as long as the fruit, but filiform. The ribs are conspicuous and raised. I doubt if this is found in California. It is manifest that Coulter and Rose have referred much southern California material to this species, which belongs to the next.

C. caruifolia is well characterized by Torrey and Gray and by Jepson. It is nearly acaulescent with several long and stout peduncles from the same root; leaves ternately and then pinnately decompound, the ultimate segments in the type linear to narrowly oblong, 2-10 lines long, not thin and delicate; fruit 3-6 lines long, broadly elliptical, the wing about half the body, oil tubes very obscure or none on the face and none on the commissure in the type. This includes Peucedanum erosum Jepson. Apparently confined mostly to the San Francisco region, though found as far south as Bakersfield.

C. caruifolia var. patens n. var.

This variety includes the normal forms with linear-oblanceolate segments 2-6 lines long, normal fruit 3-4 lines long with wing not wider than body, and evident oil tubes, those on the face occupying the entire space between the ribs and seeming single but really 2 to 4 in the intervals and 4-6 on the commissure. The type of this is my specimens from Tehachapi, California, May 20th, 1903. Probably the common form of central California.

C. caruifolia var. Vaseyi (C. & R. Bot. Gaz. 13 144 (1888) as Peucedanum).

This is characterized by the obovate segments, fruit with wings wider than the body and nearly 6 lines long, and by the occasional absence of oil tubes on the commissure. This is the prevailing form of southern California from Tehachapi southward. All sorts of intergrades are found between this and the type and var. patens. The pubescence is so variable as to be of little value. The last variety is reported as far east as Darwin mesa in the Death Valley region. I have material of what is probably another species of this group from the

Sierras, but the material is not sufficient for description.

Lomatium alatum C. & R. does not deserve varietal rank even. It is only a form of triternatum. I collected both forms at the same place.

Cogswellia serpentina n. sp.

Allied to C. millefolia. Tufted plants, 18 inches high, but acaulescent from a deep and apparently fleshy root, crowns several; leaves delicate and slender, 6-8 inches long, with narrow sheaths and short (1-2 inches long) petioles, biternate and then bipinnate, primary divisions with petioles 1-2 inches long and slender, the secondary ones evident but short on the lateral ones and 2-3 inches long on the central ones, pinnae 3-5 pairs and these with 3-5 pairs of mostly distinct, oblanceolate to obovate, apiculate segments, 1-2 lines long; whole plant smooth; peduncles stout and erect and finely striate; involucre of 2 linear, subulate, small bracts; involucels of several separate linear-subulate and hyaline-margined bracts, 2 lines long; rays many, 2-3 inches long, rather unequal but not unilateral; pedicels 4 lines long, 10-20, widely spreading, filiform; fruit elliptical, 3-4 lines long, 1½-2 lines wide, the wings about half as wide as the body, rounded and obtuse at both ends; oil tubes solitary, 2 on the commissure, large; ribs raised and sharp; top of peduncles a little thickened, also the tip of rays. Rocky banks of the Snake river near the mouth of McDougal creek, Oregon, May 28, 1901, No. 3532c Cusick.

Eryngium fluitans n. sp.

Stems prostrate, annual, widely branched; leaves linear, parallel veined, entire, succulent, 3-12 inches long, soft, with enlarged sheath-like petiole and with hyaline margins on the sheath, but not sheathing, not spinose, stem leaves shorter; heads single to cymose, oblong, black-purple, 9 lines long, 4 lines wide; bracts linear-lanceolate, 9 lines long, rigid, entire, pungent, white within, many; bractlets minute linear, obtuse, thin, terminal bracts very long and linear, 6 lines long and like the other bracts, about as long as the head; fruit 1 line long, densely covered with flattened, white processes, 3 times as long as wide. Manifestly allied to E. sparganiphyllum, but differs in the long and narrow bracts, minute bractlets, and densely scaly fruit. It grows in water where it floats, and on the muddy shores where it is prostrate and straggling; upper leaves opposite, and leaves with cross sections about every 9 lines apart. Marsh Lake, Sierra Madre Mts., Chihuahua,

Mex., Sept. 19, 1903.

Aster Madrensis n. sp.

Closely resembling A. Lemmoni, but annual, erect, slender, sparingly branched and corymbosely so; heads on slender bracteate peduncles about 1 inch long; root leaves oblanceolate, 1-2 inches long, 3-4 lines wide, tapering into a short and winged petiole, minutely serrulate, stem leaves narrower, mostly linear and acute, reduced to green and subulate bracts above; heads single, about 4 lines long and wide, with well imbricated linear and acute bracts with green centers and hyaline margins; rays many, very short, purplish, narrow: flowers many; pappus of simple and copious hairs which are capillary and not enlarged above; seeds about 1 line long, narrowly oblong, very evidently 5-nerved, puberulent, inclined to be beaked; stems usually a foot long. A similar plant collected on the Santa Cruz bottoms, Tucson, has narrow leaves and is 3 feet tall and very much branched above, with shorter peduncles and many bracts; seeds narrower. This may have been included by Gray in his A. hesperius. Also collected by me at Colonia Juarez, Chihuahua, Mex. The type is from San Diego Canon west of Juarez along streams in wet places, Sept., 1903, 6400 feet alt., in the Middle Temperate Life Zone.

Eupatorium arborescens n. sp.

Shrub 4-6 feet high, with tufted branches of the season toward the ends of the stems, stems slender and with flaky bark, and thin, erect in large tufts; glabrous leaves opposite, 2-4 inches long, thin, ovate-lanceolate and long-acuminate, serratures fine and about 1-2 lines apart, nerves 3-5 near the base, base truncate to nearly cordate, one side running down on the petiole a little; petioles about 3-6 lines long, stout; leaves narrowed and shorter toward the inflorescence and reduced to subulate bracts in the upper part of the thyrsus, not reduced on the lower pair of floral branches; inflorescence thyrsoid, 4-6 inches long, branches of thyrsus filiform, the lower about 1 inch long to the first cluster and clusters on filiform pedicels 2-4 lines long; glomerules of 2-5 heads which are nearly sessile; heads 3 lines long, including the styles; bracts about 8, linear, very acute, 1-2 outer ones shorter, 3-nerved, puberulent (pedicels and peduncles minutely woolly); flowers 4-6, very narrow, with deltoid and thick lobes, very resinous-dotted and purplish; style branches exserted fully 1 line long; akenes tapering, very pubescent.

Guayanopa Canon, Sierra Madre Mts., Chihuahua, Mex., 3600 feet alt., in the Tropical Life Zone, Sept. 24, 1903. Near to E. Palmeri and filicaule.

Polymnia nervata n. sp.

Stout and robust herbs 4-6 feet high; leaves large, opposite, deltoid-triangular in outline, 3-lobed, tips acumunate, very rough; flowers cymosely panicled and terminal, central ones long-pedunculate; outer scales oblong to oblong-ovate, about 5, inner narrower, all obtuse; rays white, fully 1 inch long, about 5, oblong-elliptical; leaves with entire margins. Guayanopa Canon, Sierra Madre Mts., Chihuahua, Mex., Sept., 1903, 3600 feet alt., in the Tropical Life Zone.

Erigeron tenuicaulis n. sp.

Resembling E. sylvestris, but a stoloniferous perennial with slender and underground stems in very open tufts; stems very slender, decumbent only at base, more slender and more striate than in E. sylvestris; all peduncles long and bracteate (4-6 inches long); root leaves oval-obovate with blade 6-12 lines long and with 2 teeth near the middle, cuneate at base, on long and very slender petioles about three times the blade, very obtuse; whole plant minutely pubescent, but appearing smooth; lower stem leaves linear-oblanceolate and acute, entire, upper linear and sessile, very much reduced on the peduncles, all entire; flowers white; rays linear, about 50, 4 lines long; top of peduncle conspicuously angled and thickened and with rather many linear bracts passing into those of the head; scales about equal, deeply grooved and rigid below, resinous, linear, acute, barely 2 lines long; heads 6 lines wide, 3 lines high; flowers about as in E. sylvestris, but seeds narrowly 3-nerved, oblong, oblique, a little flattened and with minute scaly crown. Grows on hillsides east of Hop Valley, Sierra Madre Mts., Chihuahua, Mex., 7000 feet alt., in the Middle Temperate Life Zone, Sept., 1903.

Erigeron sylvestris n. sp.

Tufted annual or biennial with no offshoots or stolons, with the habit of E. macranthus, erect striate stems simple below and corymbosely branched at top; middle peduncles long and bracteate, lateral ones short; inflorescence very open; whole plant shortly strigose; lower leaves spatulate-oblong, sessile, 1 inch long, rounded and obtuse, main leaves 1½ inches long, narrowly oblong, obtuse but apiculate, sessile, 4 lines wide, all entire, on the inflorescence gradually re-

duced to long and subulate leaves an inch below the flowers, appressed; flowers white or pink; rays shortly acuminate, in one series, 1 line wide, linear, 6 lines long, over 50; disk flowers rosin-colored at tip and with some colored nerves, tips roughened as if punctate; pappus a very short crown of very short squamellae; seeds flat, smooth, oblong-oval, nerves 2 and thick. Open woods, Soldier Canon, Sierra Madre Mts., Mex., Sept., 1903, 6500 feet alt., in the Middle Temperate Life Zone.

Erigeron Howardi n. sp.

Plants with the habit of E. pumilus, 6-12 inches high, but annual, tufted, branched near the base, sparingly so above, erect; leaves all linear, appressed, entire, sessile, 1-nerved, about 1 inch long, obtuse; stems leafy nearly to the tip, coarsely striate; heads 2 lines high, 4 lines wide, exclusive of the rays; scales very strigose, stiff, linear about equal and many; whole plant shortly strigose with ascending hairs which are tapering and rigid from a large and pustulate base; rays very many, narrow, white; flowers narrow, swelled below the middle; pappus with about 4 thread-like awns and a conspicuous chaffy lacerate crown; akenes 2-nerved, flattish, sparsely hairy, minute. This is a good Achaetogeron but for the few bristles. Colonia Juarez, Chihuahua, Mex., 6000 feet alt., Sept., 1903, in the Middle Temperate Life Zone.

Spilanthes palustris n. sp.

Aquatic, upper stems floating and with rather short internodes and 2-3 pairs of entire, linear-lanceolate, obtuse leaves on short and margined petioles, the whole 2-3 inches long and 2-3 lines wide, succulent as well as the stems; flowers pink-purple, daisy-like, on long and stout and erect peduncles; rays narrowly oblong, 4 lines long, 1 line wide, 4-striped, 10-12; involucral bracts linear, 4 lines long, green, in one series; bracts of receptacle with hyaline and fimbriate margins; akenes black, linear, without pappus; base of corolla tube vellow-hispid. This has the habit of Polygonum amphibium. Marsh Lake, Sierra Madre Mts., Chihuahua, Mex., Sept., 1903, 7000 feet alt., in the Middle Temperate Life Zone.

Pectis multiflora n. sp.

Allied to P. Rusbyi and P. Bonplandii. Annual, widely branched and with peduncles 6 inches long, slender, thickened above and subscapiform; branches with few and long internodes; leaves linear-oblanceolate and with short margined

petiole, with several large glands on the margins and setose-hairy below, light-green above and glaucous below, about 2 inches long; fascicled-stems smooth and shining, cymosely branched and with terminal peduncles; involucral scales dark, linear, acute, concave, about 20, 4 lines long, shorter than the disk flowers; rays many, yellow, oblong, toothed, 4 lines long; disk flowers many; pappus of ray of 2 long awns very stout below, of disk rather many awns of varying length, some of which are slightly flattened and hyaline. Soldier Canon, Sierra Madre Mts., Chihuahua, Mex., Sept., 1903, in the Tropical Life Zone.

Pectis papoosa var. sessilis n. var.

Akenes destitute of pappus; heads sessile. Socorro, New Mexico, and near Hillsbora. I. E. Diehl, Aug., 1903, in the Tropical Life Zone.

Porophyllum simplex n. sp.

Annual, erect, stems strict and simple below, glabrous, striate; leaves many, thin, alternate, entire, acutish, oblong-linear with a cuneate base and filiform petiole about 6 lines long, the whole 2-3 inches long; glands large, 3-4 on each side of the leaf near the edge; all the upper axils have single leafy peduncles bearing mostly a single black-purple head 6 lines long, the peduncle widely spreading and 2-4 inches long, uppermost peduncles inclined to be cymose and leafless for 1-2 inches below the head, slender; heads with 3-nerved, broadly linear, acute scales with many black dots on each side of the nerve; flowers nearly black, barely surpassing the scales, lobes about a fourth of the tube; pappus tawny as long as the corolla; akenes narrow and tapering above, about as long as the pappus. This is apparently near to P. coloratum. Guayanopa Canon, Sierra Madre Mts., Chihuahua, Mex., Sept., 1903, in the Tropical Life Zone.

Coreopsis paludosus n. sp.

Sect. Eucoreopsis. Annual, erect, paniculately branched and branches racemose from the base, striate, smooth, stems and leaves rather succulent: root leaves 6-9 inches long, long-petioled from an enlarged base, pinnately divided with long and linear lobes and the lobes rarely with one or two others at the base on the upper side, terminal lobes broader and linear-elliptic, 2-3 inches long, entire; stem leaves similar, but shorter, petioled, often entire throughout, alternate; internodes long; heads on long peduncles, 6-9 lines wide exclusive

of the yellow obovate and toothed or lobed rays, which are 6-8 lines long; outer involucre of few and inconspicuous scales, inner of very many and broad ones; disk yellow; seeds concave, not winged but callous-toothed all around the edge and with very small callus at base only, smooth, without pappus or scales, 1 line long, oval; flowers very many and barely half as high as wide. Grows in water in creeks, etc. Marsh Lake, Sierra Madre Mts., Chihuahua, Mex., 7000 feet alt., in the Tropical Life Zone, Sept., 1903.

Verbesina monticola n. sp.

Tall, erect, 3-4 feet high, slender, paniculately branched, with long internodes, scabrous throughout; leaves opposite, lanceolate, long-acuminate, serrate, 4 inchces long, at base broadly cuneate into a short (6 lines long) marginless petiole, 3-nerved, thick; heads short-peduncled, 9 lines high and wide exclusive of the 1-inch-long yellow and narrow rays; scales lanceolate, the outer acuminate, the inner obtuse; rays sterile and with small squamellae; disk akenes long-silky, with 2 stout awnlike long and chaffy squamellae and several shorter and lacerate ones. The plant resembles Helianthus Nuttallii. Mound Valley, Sierra Madre Mts., Chihuahua, Mex., in meadows, at 7000 feet alt., Sept., 1903, in the Middle Temperate Life Zone. I. E. Diehl.

Conyza pulcherrima n. sp.

Annual, tufted, erect, 1-2 feet high, stems strict and spicately flowered above with sessile large heads in the axils of the somewhat reduced leaves; white-floccose throughout, not glutinous; leaves oblong, appressed, very obtuse, pinnately incised or toothed, about 1 inch long, sessile, soft; heads 3-6 lines wide. 3 lines high; scales oblong, acuminate and beautifully laciniate and purple at tip; akenes smooth except on the sides and midrib; outer pappus of flat, thin, very short scales, not subulate. Soldier Canon, Sierra Madre Mts., Chihuahua, Mex., Sept., 1903, at 6000 feet alt., in the upper edge of the Lower Temperate Life Zone.

Hymenopappus Wislizeni var. setiformis n. var.

Biennial like the other species; lower leaflets broadly linear or spatulate-linear; heads turbinate, lemon-yellow; pappus of many setae barely paleaceous below and very narrow. It differs from H. Wislizeni in the pappus and more narrow heads as well as in the leaves. This is the common Arizona form. H. Wislizeni has nearly filiform leaflets, broad

and nearly hemispherical heads, and pappus oblong and with conspicuous hyaline margins nearly to the top, where it is quickly contracted into a short awn. Oracle, Arizona, Aug. 28th, 1903. Tucson, Santa Rita Mts., Nutt, New Mexico, and an intermediate form at Colonia Juarez, Chihuahua, Mex.

Laphamia scopulorum n. sp.

Low shrub 4-5 inches high growing in the clefts of rocks, the herbaceous stems 3-4 inches long, filiform, very leafy; leaves all dissected pedately into minute ovate to linear segments, about 1 line long; whole plant short-strigose, stems slightly branched and terminated by single heads on a peduncle scarcely longer than the leaves; heads many flowered, 3-4 lines long and wide, of linear oblanceolate bracts; rays white, several, 2 lines long; akenes linear, with cartilaginous margins, pubescent all over; awns 2, long, with intermediate fringe. This appears allied to L. Lemmoni. Colonia Juarez, Chihuahua, Mex., Sept., 1903, at 6000 feet alt., in the upper edge of the Lower Temperate Life Zone.

Berlandiera macrophylla (Gray Syn. Fl. 2 1 243 as lyrata var). This is a good species. It often has the heads nearly sessile among the leaves.

Chaenactis carphoclinia var. attenuata (Gray Proc. Am. Acad. 10 73 as species). This is not a good species. There are intergrades everywhere.

Wootonia Greene is Dicranocarpus parviflorus.

Bigelovia graveolens var. appendiculata Eastwood is not a good variety.

Guardiola Diehlii n. sp.

Erect, annual, about 1 foot high, cymosely branched above; leaves sessile, connate except the very lowest which have false petioles barely discernible, oblong-lanceolate, about two inches long, 4-5 lines wide, tapering at tip and acute and sharply serrulate to below the middle, 3-nerved, fleshy; heads vase-shaped, 3 lines long; ligule 1, white-tipped, very short and narrow; flowers 4; seeds narrowly oblong, 1-nerved, smooth and shining, 1½ lines long; otherwise as in G. angustifolia (Gray) Robinson. Albuquerque and Sorocco, New Mexico, August, 1903, Diehl.

Asclepias exilis n. sp.

Low, erect, a few inches high; internodes short; leaves opposite, short petioled, cuneate at base, ovate, acute, 2 inches long, thick; whole plant shortly-pubescent, peduncles ter-

minal, longer than the leaves, 3-4 inches long, erect; filiform pedicels 1 inch long, many; petals lead-colored, oval, 1½ lines long, white margined; hoods cuneate-obovate, as long as the stamens, corners produced into filiform horns as long as and the same in appearance as the horns which are conspicuous; hoods 1 line long. Pastorilla, Zacatacas, Mexico, May 2, 1892.

Asclepias Jaliscana n. sp.

Shruby at base, 2 feet high, slender, paniculately branched; leaves linear-acuminate, 2-3 inches long, 1-nerved, lighter below, revolute, larger, above 2 lines wide, green above, spreading by the bending of the tip of the conspicuous petiole like Abies; internodes short; peduncles sub-terminal, 1 inch long in flower and 3 inches long in fruit; pedicels 6 lines long, many, filiform; petals lead-purple, with white margins, elliptical, 1½ lines long; hoods at least white-tipped, narrow, nearly linear, rounded at tip, with involute tip 1 line long, barely surpassing the stamens; horn very long and filiform, 1 line long; pods fusiform, 4 inches long, erect on an erect pedicel, smooth. Chiquilistlan, Jalisco, Mexico, May 28, 1892.

Asclepias senecionifolia sp.

Stems very short and ascending, 3-4 inches long; leaves many, alternate, linear, revolute, canescent below, 2 inches long; peduncles sub-scapiform, 4-5 inches long, several, slender; pedicels 10 lines long, filiform, pubescent, many; petals lead-colored, oval, with white and hyaline margins, 1½ lines long; column none; hoods very thick, yellowish, boat-shaped, sessile, a little longer than the stamens, tip rounded, sides involute, and produced at tip into broad-triangular teeth surpassing the hood; horn stout, thick and conspicuous. Santa Cruz, Jalisco, near Tapalpa, Mexico, June 14, 1892.

Asclepias contstricta n. sp.

The erect stems stout and mostly simple, about 2 feet high, nearly glabrous; pedicels and peduncles shortly-pubescent; under side of leaves lighter colored, leaves opposite, on stout petioles 6 lines long, blade oval to narrowly oblong, and apiculate, 3-5 inches long, 1½ to 2½ inches wide, with many ascending veins; peduncles in the upper axils, 1-2 inches long, filiform pedicels 8 lines long, many; flowers small, white; sepals linear, 1½ lines long; petals white, nearly oval, 2 lines long; column manifest; hoods yellowish, on a stalk half as long as the anthers, ovate-oblong, with an almost cordate base, tip rounded and flat, surpassing the stamens by

a half, sides prominently triangular-toothed, horn absent; internodes short; habit of A. speciosa; No. 318. Volcano of Colima, July 13, 1892, and at Tapalpa, Jalisco, Mexico, June 10, 1892.

Amsonia latifolia n. sp.

Leaves ovate, shortly acuminate, nearly sessile, 1-2 inches long, many and overlapping, entire; follicles 2½ inches long, 1-2 lines wide, not torulose, linear, erect and straight; calyx minute, with subulate lobes longer than the tube; flowers lead-purple, about 8 lines long, the linear lobes nearly as long as the tube and lighter colored, flowers many in condensed corymbs, the tube bearded densely at tip and less so below; pedicels short; stems many from a thick, straggling and woody root, erect 12-18 inches high; this prefers clayey and alkaline soil. Monroe, Utah, May 24, 1899; No. 5093, Pagumpa, Northern Arizona, April 21, 1894; No. 5289aa Navajo Well, Northern Arizona, May 24, 1894, and No. 5479q, Grand Junction, Colorado, June 21, 1894.

Nemophila Arizonica n. sp.

A close congener to N. aurita, but leaves much shorter and fewer lobed and with a short petiole, lobes oblong and obtuse; flowers not surpassing the calyx, 3-4 lines long; peduncles about 1 inch long; calyx lobes not over 4 lines long; whole plant less armed; otherwise as in N. aurita. The latter species has long and narrow leaves with acute lobes and acuminate tips, the corolla being twice the calyx, peduncles 2 to 3 inches long. Yucca, Arizona, May 14, 1884, Chimihuevis Mts., Arizona, April 21, 1903.

Conanthus parviflorus var. pumilus n. var.

Leaves shorter than in the type, 6-9 lines long, oblanceolate to spatulate; internodes longer; calyx lobes spatulate-linear. Washoe Lake and Reno, Nevada, June 3, 1897.

Phacelia neglecta n. sp.

This has been confused by Gray with his P. pachyphylla with which it is allied, and from which part of his description of his type was taken. Like P. pachyphylla it is a low annual with much branched thick stems; it is fleshy and leathery throughout with long and stout petioles, short-pubescent leaves with nearly round and crenate blade 1-2 inches wide and densely fruited racemes 2-3 inches long; seed many; capsules oval, on pedicels ½ line long, as long as the calyx lobe; these are characters which the two species have in common.

This species differs in the stout and axillary racemes flowered to base barely surpassing the leaves and simple; pubescence ashy, hardly at all viscid; pedicels mostly reflexed in fruit; capsule 2½ lines long: calyx lobes lanceolate; flowers minute, barely 1 line long, white, with broad lobes, included stamens and style cleft nearly to the base. P. pachyphylla has soft-pubescent leaves, is very viscid-glandular throughout, has a more erect habit with terminal and geminate peduncles more or less evident and inflorescence greatly surpassing the leaves; pedicels erect; pods 1½ lines long with linear sepals; flowers blue, about 4 lines long and three times as long as the sepals, companulate and very broad (about 4 lines wide); stamens as long as the lobes; style 2-cleft to the middle. This latter species abounds from Death Valley to the Mojave, while P. neglecta is so far found only at the Needles on the Colorado river. Both these species by their seeds belong to the section Microgenetes, but in habit belong with P. demissa, and differ from both in the styles, and approach P. pulchella. It is a significant fact that we have so many long flowered species with their corresponding short-flowered relations, which seem to be distinct from each other such as caerulea and invenusta, pulchella and demissa, pachyphylla and neglecta, Emmenanthe glaberrima and pusilla. P. neglecta was found at the Needles, California, May 3, 1884, No. 3792.

Emmenanthe glaberrima Torrey in Bot. King. 257 (1871).

This would appear to belong to section Microgenetes of Phacelia and probably does. Nearly prostrate, weak and delicate, annual, a few inches long, with filiform stems, peduncles and pedicels; minutely hirsute throughout, except the peduncles and pedicels, not glandular nor viscid; leaves oblanceolate to spatulate, 6 lines to 2 inches long, normally 1 inch long, the lower occasionally 6-toothed in the middle, otherwise entire, obtuse, the petiole as long as the blade; peduncles at every node, 2-4 inches long, laxly racemose nearly to the base, 4-6-flowered; pedicels ½ line long in flower and 1½ lines long in fruit, ascending; calyx in flower about 1 line long, with broadly linear and obtuse lobes which in fruit become 2 lines long and rather spatulate, corolla at first nearly as long as the calyx, white with oblong lobes and included stamens, persistent, at length not over one-half to one-third the calyx and half as long as the capsule; capsule oval, 1½ lines long, very obtuse, 6-seeded; seeds deeply favose and cross-wrin-

kled, ovate; remotely related to P. micrantha and to Ellisia. Emmenanthe as now regarded stands on a slim foundation.

Phacelia invenusta Gray Proc. Am. Acad. 20 303 (1885).

Dr. Gray in the Synoptical Flora, p. 414, says that P. caerulea and invenusta are the same, but in this he is mistaken; both are good species. P. caerulea has leaves with blade 2-3 inches long, which is broadest in the middle and with many lobes going nearly to the midrib; the racemes are dense and with about fifty flowers when old which are contiguous; the pods are oval, about 1 line long, equaled by the narrow calyx lobes; flowers blue; seed oblong. P. invenusta has leaves with blade barely over 1 inch long, lobes few and only the lowest going to the midrib, leaves broadest above; racemes laxer, only the upper pods contiguous, rarely more than fifteen flowered, pods spherical, nearly 2 lines long, surpassing the spatulate lobes; seeds oval, with dark center conspicuous; flowers white.

Phacelia ambigua n. sp.

This closely resembles P. crenulata, but is setose-hairy throughout; seeds favose-reticulated. No. 3822, Needles, California, May 5, 1884: No. 5036ae, Hole in the Rock, northern Arizona, April 13, 1894; Franconia, northern Arizona, April 17, 1903, and Caliente, Nevada, April 29, 1904.

Gentiana angusta n. sp.

Stems tufted, decumbent; whole plant bright green; internodes short; leaves linear, with revolute margins, gradually narrowed to the acute tip, 1-2 lines wide, 1½-2 inches long, roughened; flowers 1-3, racemose, on pedicels 6-8 lines long, floral bracts not different from the leaves; flowers cuneate, 1 inch wide, 1½ inches long, with erect oval and cuspidate lobes 2 lines long, the plicae short and with short laciniae; corolla greenish-blue at tip; calyx cleft nearly to the base with linear lobes 6-8 lines long; manifestly a congener to G. affinis; root thick and fleshy. This grows in meadows along with other gentians. Mound Valley, Sierra Madre Mts., Chihuahua, Mexico, Sept. 18, 1903, at 7000 feet alt.

Nicotiana trigonophylla var. Palmeri (Gray Syn. Fl. 242 as species). This is only a more robust form of the type with a slightly longer corolla, but intergrades are common.

Cuscuta gracilis Rydberg is C. planiflora Tenore and is also C. Anthemi Aven Nelson. All the species of this group to which planiflora belongs have linear stigmas.

Ipomoea armata var. patens (Gray Syn. Fl. 434 as capillacea var. patens).

Ipomoea Diehlii n. sp.

A slender twining herb; leaves distant, set at right angles to the petioles, reniform in outline, deeply 5-lobed, venose, minutely muricate, slightly pubescent, lateral lobes obliquely rhomboidal and acute, the others with long-acuminate tips, the central one ovate from a much contracted base, all but the central one are narrower; slender petioles 1 inch long; peduncles stout, 1 inch long, 2-bracted at tip, 1-flowered; stout pedicels 6 lines long, equaling the oblong-lanceolate and slightly and shortly-pilose calyx lobes; corolla funnel-form, purple, 4 inches long, 2 lines wide, regularly contracted to the base, glabrous, delicate. Collected by Diehl in San Diego Canyon, Sierra Madre Mts., Chihuahua, Mex., Sept. 16, 1903, at 6400 feet alt.

Phlox linearifolia var. longipes n. var.

Stems slender, matted, caespitose from a deep and erect root, normally 1-4 inches long; internodes very short, mostly 1-2 lines long; leaves filiform, acerose, 1-2 inches long, very many, nearly glabrous below; upper part of plant glandular-hairy, the calyx densely so; pedicels filiform, sub-terminal; flowers 1-3, when single the pedicel is 1-2 inches long; calyx with subulate and acerose tips 5 lines long, hyaline angles prominent; corolla pink-purple, the tube nearly 9 lines long, the lobes rhomboidal and 3 lines long; style 4 lines long; growing in sand. The type is the specimen from Weiser, Idaho, April 28, 1900. Other specimens are from Pocatello, June 11, 1902; middle fork of Weiser River, Idaho. July 14, 1899, and an intergrading specimen is A. Nelson's, No. 4544. from Evanston, Wyo., June 5, 1898. I also have hybrids of P. linearifolia and longifolia from Pocatello which closely resemble P. nana.

Gilia Bigelovii var. Jonesii (Gray Syn. Fl. 2 407 as species). This is not a good species, it is practically a glandular and weak form only.

Gilia dichotoma var. integra, n. var.

Leaves all entire; calyx and lobes shorter; quite distinct from G. dianthoides. Cajon Pass, California, May 16, 1903, and Victor, California, May 18, 1903.

Gilia leptomeria var. myriacantha, n. var.

Flowers densely panicled and innumerable; corolla 2 lines

long, the lobes acuminate and lacerate; plants forming a round tuft. Needles, California, May, 1884. Typical G. leptomeria has sparse flowers and short corolla.

Gilia brecciarum n. sp.

Allied to G. inconspicua; cymosely divaricate and low annual; branched from the base; root leaves like those of G. inconspicua var. sinuata, linear, deeply much toothed with triangular and aculeate teeth, stem leaves conspicuous, sessile, ovate, green, deeply toothed; bracts large, ovate, 1-3 lines long; upper part of plant very glandular-hairy, so much as to almost conceal the calyx; calyx ovate with narrow and triangular and acicular tips 1 line long; flowers 2 lines long, purple, with short lobes, and the two barely surpassing the calyx; pedicels mostly none, rarely 2-3 lines long; flowers in short and one-sided racemes. Contact, Nevada, July 26, 1901.

Gilia latiflora var. cana. n. var.

Leaves repand-dentate, rigid, densely hoary, 1-2 inches long, the rest of the plant glandular-hairy; pedicels 2-6 lines long; flowers with yellow throat and dark-purple tube and lobes, tube 6-8 lines long, the throat funnel-form and 2 lines long, lobes oval and 2 lines long. Lone Pine, California, among granite rocks at 7000 feet alt., May 14, 1897.

Gilia latifolia Gray.

A new description of this plant seems desirable. It is allied to G. scopulorum; whole plant yellowish-green, erect, annual, paniculately branched from the base, 4-12 inches high, hairy throughout and glutinous; root leaves many, about 3 inches long and 1-2 inches wide, obovate, the base rarely incised or with a small pair of lobes, coarsely dentate with spinulose teeth which are 1-2 lines long, thick-veined, leathery; petioles very stout, margined, one inch or less long; lower stem leaves similar but smaller, gradually reduced toward the flowers to small, rigid, subulate, and acerose bracts; flowering calyx campanulate, 1 line long with subulate lobes as long as the tube, in fruit enlarging to 1½ to 2 lines long; corolla purple, 2 to 2½ lines long, the broad tube about as long as the calyx and cylindric and a little widened above to the lobes, the lobes oval and 1 line long; pedicels filiform, a few lines long in flower, in fruit often 1 inch long and erect; flowers many in an open panicle; capsule 2 lines long, oblong-oval, obtuse, several seeded; seed yellow, round, about one-fifth line long. My specimens from the Needles, California, have

most of the pedicels 1-2 lines long, flowers in dense panicles, some stem leaves broader and even oval to reniform and sessile. This is a very characteristic species and varies but little, growing in sand in the Tropical Life Zone. Specimens of this in my herbarium are my No. 3826 from the Needles, California, May 5, 1884, a specimen from southern Utah collected by F. M. Bishop many years before in Powell's expedition down the Colorado, also specimens from Panamint Canyon, May 3, 1897, and Death Valley, California, May, 1906, all collected by myself.

Gilia scopulorum Jones was always confounded with G. inconspicua by Gray, but it is easily separated from that by the color of the leaves alone, their softness and pubescence and also by the peculiar flowers. The leaves are incised after the style of G. incisa. The flowers are remarkable for the varying length of the tube on the same plants, which go from not longer than the calyx to four times as long. This is shown well by my specimens from Shepherd's Canyon, California.

Gilia aggregata var. maculata n. var.

Tall and virgate, green; flowers large, about 1½ inches long, obovate-lanceolate lobes nearly half the whole, beautifully mottled with red and yellow and white even in the bud and with short and filiform tips. Soldier Canyon, Sierra Madre Mts., Chihuahua, Mexico, at 6000 feet alt., Sept. 16, 1903.

Gilia pharnaceoides var. Harknessii (Curran Bull. Cal. Acad. 1 12 as species). This cannot be maintained as a species. It is very common in the Great Basin.

Gilia atrata n. sp.

Like G. filicaulis, but flowers shorter than the calyx lobes and stamens not exserted; neither bracts nor calyx lobes dilated. The type of this is the specimen from Salmon Meadows, Idaho, at 4000 feet altitude, July 22, 1899. To this I also refer my No. 2465 from Soda Springs, California, July 23, 1881; also those from Emigrant Gap, California, June 30, 1882; and Colfax, California, July 3, 1882.

Gilia Schottii, setosissima and Mathewsii are only varieties of one species, though they appear to be remarkably distinct, for they have all sorts of inter-grades.

Gilia debilis Gray. This has been one of the rarest of all the genus and has been given several names. The writer de-

scribed it as Gilia Howardi soon after it was first published by Gray, it having been found by Professor Howard of the Utah State University near Lima, Mont. It has also been found in very loose volcanic soil on Mt. Hood and in the Northwest by several people. It is manifestly a Collomia and has recently been rediscovered by myself in alpine situations in the Wasatch Mts. at 11,200 feet elevation, spreading over quartzite rocks where there was almost no soil and eking out an existence by the little roots running along the crevices in the rocks in flat places.

Gilia Klickitatensis Suksdorf is G. squarrosa.

Gilia Columbiana Suksdorf is G. capillaris.

Mertensia linearis Greene from La Veta Pass, Colorado, appears to be M. brevifolia.

Mertensia obtusiloba Rydberg. Rydberg. says of this "flower clusters several from the axils from the upper leaves." The flowers are young and so they necessarily form a dense terminal head, and therefore the lower clusters are leafy-bracted. He says, "Sepals obtuse," but they are often acute. He says the sepals are "scarcely more than half as long as the tube of the corolla." The sepals are but a trifle shorter than the corolla tube. He says the "stem is not depressed nor prostrate," while it is both. There is no difference between M. Tweedyi. obtusiloba and brevistyla, none of Rydberg's characters being of any separating value, while the original M. brevistyla of Watson I have collected in its type locality and know that it usually has ovate upper leaves; therefore the only character left lies in the short style to separate it from M. alpina; my specimens of M. obtusiloba have a short style, other specimens from the Argentine Pass of my No. 54 cited as part of the type have linear-lanceolate, acute and rough leaves and very small corolla; these grow in gravelly soil, more exposed to the weather, and therefore were smaller, more erect, and rougher and with smaller and sharper leaves, which is a characteristic of all Mertensias growing in open places. The inflorescence is also much contracted in that case. I can see no valid character to separate M. alpina into any of these species; one character common to all forms of this species is the peculiar rough whiteness of leaves and corolla, the latter is deep blue but has this fine dusty roughness in addition. M. brevistyla may be kept up as **M. alpina var. brevistyla** (Watson Bot. King. 239 (1871) as species)

characterized chiefly by the open panicles with filiform pedicels when fully mature.

The many species of Mertensia made by Greene and Rydberg have no foundation whatever. It is an utter impossibility to take a miscellaneous collection of specimens and have anything but confusion result in attempting to make them fit. M. Sibirica and paniculata run together and M. oblongifolia and lanceolata cannot be kept apart except by arbitrary rules. M. alpina is easily separated by the sessile anthers. The various species proposed are like the many spurious species of Krynitzkia based on mostly immature specimens which are not sufficiently developed to show the normal state of the plant, while the pubescence of which Greene makes so much is simply a question of shade or sunshine.

Coldenia Anglica Watson. In describing this species Watson speaks of a flowering specimen of the writer's collection from San Quentin as belonging to it. The writer was never in San Quentin and so never collected there. Watson's statement is therefore an error.

Nama coldenioides n. sp.

This is my No. 3869 in part from the Needles, California, May 10, 1884, and distributed with Coldenia Palmeri. The plant is almost exactly the same in habit and appearance as Coldenia brevicalyx, except that the calyx lobes are a trifle longer, the pod oblong and two-thirds the calyx, and few-seeded, the corolla being about the size and shape of Nama demissum and four times the calyx. General description. A low shrub 1-2 feet high, divaricately and cymosely much branched, main trunk tortuous with dark brown flaky bark in thin layers, last season's twigs with white sulcate and pubescent bark; twigs slender: lower internodes 2-3 inches long; whole plant canescent with short and strigose hairs and some setae; flowers in dense clusters at all the nodes, sessile, 6-10; calyx ovate, hoary, with green and subulate lobes, the whole 2 lines long, lobes fully as long as the tube; leaves obovate, thick, with cuneate base and revolute margins, and with about two pairs of nerves, entire, blades, 3-4 lines long, on a slender petiole fully as long; growing among rocks.

Plagiobothrys Jonesii Gray is an Amsinckia in everything but the flowers, which are white. It has the tessellated pavement-like nutlets of A. tessellata and a little sharper rugae, and illustrates again the very slim foundation on which

some Borraginaceous genera rest.

Sonnea Greene. There is no occasion whatever for the erection of this genus. Greene takes the two most divergent groups of Krynitzkia, namely, the Ambigui and Hypsoula, and unites them into this genus and leaves the intermediate species to form Plagiobothyrs, apparently basing his genus on habit, but strangely omitting to include P. canescens with similar habit and Allocarya mollis which also has a similar habit.

Sonnea Cusickii Greene well illustrates the absurdity of Greene's distinctions. The No. 1661 of Cusick distributed by him contains not only Greene's type but also Allocarya Nelsonii, which is known by the setose-tipped transverse rugae, and the rest are Allocarya hispidula, showing that all these so-called species grew together.

Amsinckia tessellata var. macrosepala, n. var.

Corymbosely branched from the base; leaves very large and broad, ovate to oblong-ovate on the stem; spikes 4-8 inches long, strict, about 1 inch wide; fruiting calyx 6-8 lines long, with loose triangular and ovate lobes 2 lines wide at base; whole plant sparsely setose and leaves covered with white pustules; nutlets with few corrugations but compactly set, with pavement-like surface. Reno, Nevada, June 10. 1897: Dutch Mountain, Utah, June 8, 1890; Mojave, California, May 20. 1903. Very common from Reno, Nevada, to Congress Junction, Arizona.

Amsinckia Idahoensis n. sp.

This is closely related to Plagiobothrys Jonesii apparently. Robust, paniculately branched annual, 2 feet high, most of the axils either with single flowers or with short peduncied heads of flowers which in fruit are about an inch across and with about a half dozen flowers with leafy bracts as long as the mature calyx lobes; whole plant sparsely setose with white hairs standing out at right angles; calyx shaggy: leaves ovate-oblong, 1½-2 inches long, sessile, flecked with white pustulate spots whose covering is beautifully and radiately rugose; calyx about 6 lines long with linear and loose lobes; nutlets obliquely ovate, 1½ lines long and 1 line wide, compactly and sharply tubercled, but not pavement-like, a little transversely rugose at the sharp tip, distinctly keeled on the back and sharply so at tip, convex and longitudinally arched to a quarter circle, ventral face slightly concave both

ways and with a large, oval, basal, flat, thin-rimmed caruncle which even projects a trifle below the base of the nutlet, the nutlet is far less rounded than usual, this joins the ventral ridge, which is continuous to the tip of the nutlet; nutlet nearly that of a A. intermedia, but caruncle much larger and somewhat lower; inflorescence wholly different; terminal flowers and fruit forming a short and broad spike not over 4 inches long; young flowers not seen. Weiser, Idaho. 1899.

Krynitzkia Texana is very closely allied to K. recurvata, the only difference being the broader nutlet with relatively shorter sepals and stouter habit. I have it from the type locality of Hall, No. 469.

Krynitzkia leiocarpa has the character of filiform scar going to the very base of the nutlet, but it does not hold, as I have specimens in which in the same calyx, one nutlet has a deltoid enlargement at the very base, while the others are normal. This is in my No. 2339.

Fraxinus attenuata n. sp.

Allied to F. pistaciaefolia and F. viridis; leaflets 3-5, attenuate-acuminate at both ends and serrulate, 2-4 inches long, smooth, about 6 lines wide, on long petioles and rachis; fruit 1-1½ inches long, wing 1 line wide and tapering regularly to the base, winged at least to the middle, linear, many in slender and compound racemes on filiform pedicels; small trees, variously referred to the two species mentioned. Valley of Palms, Lower California, No. 3741, April 8, 1882; Catalina Mts., Arizona, June 15, 1903, Thornber.

Fraxinus nummularis n. sp.

A small bush several feet high with divaricate and rigid short branches; leaves simple, oval, about 6-9 lines long, entire, obtuse, leathery, on short and margined petioles, smooth and green, reticulated; pistilate flowers few in a very short and simple raceme 6 lines long produced like F. anomala; fruit linear-cuneate, 9 lines long, winged only at the tip of the linear body, wing 1½ lines wide, 4-5 lines long; pedicels about 1 line long; male flowers not seen. Sierra Mojada Mts., Mexico, April 19, 1892.

Pentstemon desertorum n. sp.

Section Genuini near to the puniceus group; tufted plants about 6 inches high, with simple and erect stems, 1-2 rarely 3 pairs of leaves from a woody and branched base; basal

leaves oval-ovate, tapering into a slender petiole as long as the blade, mostly entire but rarely with a few teeth, 1-2 inches long; upper stem leaves linear-oblong and acute, sessile, 1-1½ inches long, rarely with a few teeth, inclined to be ashy and minutely pubescent, especially on the upper leaves; inflorescence pruinose-pubescent, 2-6 inches long, verticillate-spicate and dense, leafy-bracted below with triangular-ovate and auricled bracts; flowering pedicels very short, in fruit slender and 2-4 lines long, erect; whorls with 3-8 flowers; flowers red, about 5 lines long, narrowly funnel-form, 3 lines wide at the slightly spreading small and rounded lobes, ascending, when dry they have a purplish tint; lobes of flowers 1½ lines long and wide, the lower ones a little longer; calyx lobes lanceolate-acuminate, 4 lines long and like the stem and pedicels purplish and with glutinous and very short hairs; pods ovate not equaling the marginless calyx lobes, 3 lines long; sterile filament enlarged at the tip and inordinately bearded nearly to the base with yellow hairs; anthers white. This grows in clefts of the rocks, at 4000 feet altitude, in the Tropical Life Zone at Kelso, California, May 2, 1906.

Pentstemon calcareus n. sp.

Section Genuini near the puniceus group, probably nearest to P. spectabilis; densely caespitose and much branched from a woody base, about 6 inches high with spreading stems. The plants forming open mats 1-2 feet in diameter; all but uppermost leaves on broad margined petioles about half as long as the oval-ovate mostly folded and acute, thick, spinulose-toothed blade which is about 9 lines long and light green; plant appears smooth, but is minutely ashy-pubescent; inflorescence appears smooth and oily, but is minutely glutinous, hairy and dark; uppermost leaves sessile, but not clasping; bracts very small but green and triangular; inflorescence about 2 inches long, loose, thyrsoid-panicled, the main panicle with two accessory ones coming from the top pair of leaves, which are 6-8 lines long, these are crowned with two green bracts and 3-5 pedicels. of which all but the central one are bracted in the middle and often branched; these pedicels in flower are nearly black and 2-4 lines long, filiform and rather widely spreading at base; flowers deep pink drying to purple, about 9 lines long, narrowly campanulate to the tip of the calyx, where the tube abruptly narrows and is 2-3 lines long, top of flower at base of lobes 3 lines wide, the two lower lobes

widely spreading, oblong-oval, and 2 lines long, tube striped at base of lobes and sparsely yellow-bearded; sterile filament slender and smooth; sepals ovate, acute, marginless, 1½ lines long, anthers white. This looks like a diminutive P. spectabilis, but is a very well defined species, growing in very hot and dry and exposed places on rocky limestone ridges and slopes near Indian Springs, Charleston Mts., Nevada, at 4000 feet altitude, May 7, 1906.

Pentstemon albomarginatus n. sp.

Section Genuini near to the puniceus group; whole plant smooth and shiny and appearing as if glaucous, but not really so; roots deep, fleshy, and long, branching at top into many rod-like, herbaceous nearly simple and erect stems about 1 foot long; internodes short; leaves and calyx lobes, linear-lanceolate, very acute, 2-3 lines long, conspicuously white-margined with thin and hyaline edges, the former elliptical-oblanceolate or sometimes the lowest ones 2-3 inches long, cuneate-spatulate, sessile, but none clasping nor auricled, entire, upper ones acute, 1½ inches long, 4-6 pairs, gradually passing into a short and leafy thyrsus which is mostly simple (rarely branched): leaves longer than the flowers; whole plant leathery and a little fleshy, smooth and shining; the peduncles none and pedicels several, angled when dry and 1-6 lines long, nearly horizontal: funnelform flowers light-pink with a purplish tint and drying purplish, 9 lines long, spreading, a little ampliate above the middle, the oval-ovate lobes unequal and spreading, but little over 1 line long, the central lower one the smallest; pods ovate, 5 lines long; top of tube barely 3 lines wide; anthers purple; calyx lobes with reflexed tips; sterile filament filiform, beardless, but the corolla densely yellow bearded from the notch between the lower lobes to near the base. Fresh flowers have the tube 2 lines long and 1 line wide, widest at base, then abruptly enlarged to 1½ lines wide and nearly tubular, but widening a trifle, obcompressed, 1 line thick, 2 lines wide with rounded back and doubly plicate belly, with about 8 purple parallel veins along the plicae, throat whitish. This most conspicuous and remarkable plant grows in drifting sand at Good Spring Station, Nevada, April 29, 1905. Yucca, Arizona, May 19, 1884.

Pentstemon acuminatus var. Fendleri (Gray Pac. R. R. 2 168 as species) P. collinus A. Nelson. This is intermediate between the type and the variety congestus Jones and repre-

sents the obtuse-leaved forms with lanceolate sepals.

Pentstemon glaber var. Wardi (Gray Proc. Am. Acad. 12 82 as species). This is only a rough-pubescent form. It occurs from the Sierras at Summit and Susanville, California, to eastern Utah, mostly in dry regions and low elevations and differs from P. Fremonti only in the larger corolla, anthers split only two-thirds of the way up, and in the broader root leaves.

Pentstemon glaber var. Fremonti (T. & G. Pros. Am. Acad. 6 60 as species).

Pentstemon confertus var. attenuatus (Douglas Bot. Reg. t 1295 as species).

The corollas of Pentstemon deustus are remarkably declined.

Pentstemon eriantherus Pursh was published in 1814, its synonym P. cristatus Nuttall was a nomen nudum in 1813 in Fraser's catalogue and was not published until 1818 in Nuttall's Genera, it can not therefore supersede the earlier name of Pursh, which was also a nonem nudum of Nuttall in Fraser's catalogue. It should also be noted that Pursh's reference to the name of Nuttall is an error.

Pentstemon eriantherus var. argillosus n. var.

Flowers 8-12 lines long, about 4 lines wide, often only twice the calyx lobes; sterile filament not exserted, slightly long-bearded at top; corolla regularly funnel-form, upper side not arched; calyx sparsely and shortly villous; thyrsus elongated and whorls distant. John Day Valley, Oregon, June 6, 1902, Cusick, No. 2803. This differs from the type which has the calyx long-villous, flowers 6 lines wide at tip and arched, with exserted and very villous sterile filament and condensed thyrsus, flowers over 1 inch long.

Pentstemon Cleburni n. sp.

This is between P. eriantherus and Jamesii; plants rarely over 1 foot high, rough-pubescent on the leaves and shortly and sparsely villous on the inflorescence and obscurely if at all viscid; stem leaves in well developed plants linear-spatulate or broadly linear, always entire, mostly surpassing the dense and leafy thyrsus which begins near the root; root leaves tufted, oblanceolate to oval, rarely obscurely dentate, long-petioled and petioles broad and 2-4 inches long; calyx nearly sessile even in fruit and clusters very dense; calyx lobes mostly ovate with a short acumination, occasionally lanceo-

late and 3-4 lines long, shorter than the rhombic-ovate capsule; flowers light-colored, fully 1 inch long, abruptly ventricose at end of calyx tips and 4-5 lines wide, arched, upper lobes longer than the lower; sterile filament barely exserted and long-villous. This is often confused with P. Jamesii, which has narrower calyx lobes and no enlarged root leaves. This was probably included as a part of his P. cristatus by Nuttall at least in his Fraser's catalogue. This is common on the Green River Desert, Wyoming, at Granger and Green River and appears to have been first collected since the time of Nuttall by Cleburne, June 27, 1875. It is also A. Nelson's No. 4716.

Pentstemon subulatus n. sp.

Allied to P. centranthifolius; strict, erect, tufted, stems simple and with narrow thyrsus; glabrous and glaucous throughout, root leaves occasionally obovate, mostly spatulate to oblanceolate, all short-petioled; stem leaves all sessile with cordate base and grass-like, linear-subulate, 2-4 inches long, gradually reduced above to subulate bracts; internodes longer than the upper leaves; flowers red, narrowly tubular, 1½ inches long, the lobes oval 1 line long and a little spreading, the tube 1½ iines wide, the throat 2½ lines wide; stout peduncles all opposite, 1-2 inches long, 2-5-flowered, appressed, occasionally proliferous, slender pedicels 4-6 lines long; calyx hemispherical 2 lines long, the lobes reniform-ovate with a triangular tip, hyaline below and 2 lines long; anthers explanate, the cells short and broad; sterile filament enlarged above and glabrous; length of peduncles and pedicels variable, sometimes the pedicels are 9 lines long and the peduncles 2 lines long, but the habit and floral characters are constant. The type is from Hackberry, Arizona, April 25, 1903. Other specimens are from Wickenberg, Arizona, May 5, 1903, with the short peduncles and long pedicels; and Hillside, Ariz., May 1, 1903, with calyx lobes having subulate tips.

Pentstemon confusus var. patens.

Like the type except the flowers, which are about 6 lines long with short tube more abruptly widened into the throat and short lobes but little spreading, peduncles often 1 inch long and spreading, forming an open and not compact thyrsus, stamens as long as the calyx tube, sterile filament as in the type, plants 6-18 inches high. Lone Pine, California, 7000 feet altitude, May 14, 1897.

Pentstemon divergens n. sp.

Section Speciosi; anthers horseshoe-shaped, with rather narrow cells, splitting to the partition but not through, smooth; plants apparently belonging close to P. cristatus, but anthers different and flowers red; roots thick and woody; stems tufted, simple, erect, very leafy below with mostly short internodes, 1-2 feet high, the interrupted and leafy and compact spike often over half the whole; leaves ashy-rough-pubescent, 2-4 inches long, the lower lanceolate on short petioles and 1 inch wide, the stem leaves mostly sessile and ovate-lanceolate with cordate base, and those subtending the floral clusters ovate and about 1 inch long, the upper ones shorter, all leaves acute; flowers many in dense clusters; peduncles and pedicels almost none; calyx large, ovate; sepals oblong-ovate, acute, nerved, green, 3-4 lines long, mostly with acuminate tips; whole inflorescence shortly glandular-hairy; corolla 1 inch long, rather abruptly widened 2 lines above the base and ventricose, the lobes very broad and short, slightly bilabiate, the lower lobes reflexed; throat 4 lines wide; sterile filament densely short-bearded; dried flowers rather-purplish-red. This certainly lies close to P. miser and the latter is much nearer to P. pumilus than the classification of Gray would seem to indicate. Bishop, Owen's Valley, California, 5000 feet altitude, May 15, 1897.

Pentstemon puberulus n. sp.

This belongs to the P. heterodoxus section and resembles it; casepitose, simple stems erect, 1 foot high; root leaves many, spatulate to oblong-spatulate, obtuse, on slender petioles 1-2 inches long; lower stem leaves similar but longer and narrower, often 4 inches long, acutish; upper stem leaves narrowly oblong, sessile, not auricled, 1-2 inches long; all leaves puberulent, but not glandular; thyrsus narrow, interrupted, leafy-bracted below, very shortly glandular-hairy even to the corolla; flowers clustered at the nodes; peduncles and pedicels slender but mostly shorter than the calyx; calyx 1½ lines long, with lobes lanceolate and having purplish but scarcely hyaline margins; corolla deep-purple, tubular funnelform, 1 inch long, gradually widened from base to tip, where it is 2-3 lines wide, scarcely bilabiate, the lobes short and rounded and little spreading and the lower ones the longer, corolla arched. Summit, Owen's Valley, California, 7000 feet altitude, May 22, 1897.

Pentstemon pseudohumilis n. sp.

This is of the P. miser-Moffattii group; caespitose simple stems erect, 1-1½ feet high, interruptedly spicate except on the lower third, lower glomerules leafy-bracted, all but the inflorescence shortly rough-pubescent and that shortly pubescent and rather densely so, with flattened and twisted blunt hairs appearing as if glandular, but apparently not so; root leaves lanceolate and long-petioled with the petioles margined, 3-4 inches long, occasionally with a small tooth or two; stem leaves sessile, linear-oblong or the upper triangular-lanceolate and rather abruptly reduced above to short and green bracts equaling the calyx; inflorescence densely and interruptedly spicate, the dense glomerules with mostly no peduncle or 1 line long and very stout, which is densely bracted and flowered at tip; slender pedicels about 2 lines long at least in fruit; calyx green; calyx lobes linear-lanceolate, nervose, not margined, 2-3 lines long; flowers deep blue, 6 lines long, regularly funnel-form from the base, throat 2½ lines wide with broad, large and spreading lobes; anthers not much divaricate; sterile filament short-bearded down one side. This has the general appearance of P. humilis and the habit of P. Moffattii, but the corolla is half smaller and deep blue and the calyx only half the size and the lobes equal the narrow pod. This grows in clay soil at Price, Utah, May 29, 1898.

Pentstemon scrophularioides n. sp.

This is near to P. Palmeri; 2-4 feet high, erect, stout; lowest leaves obovate, short; lower stem leaves oblanceolate to narrowly elliptical 4-5 inches long, short-petioled, with short axillary leaves; upper leaves oblong to triangular, the bracteal ones shorter and with cordate base, all leaves sharply and irregularly dentate; thyrsus open and few flowered, peduncles stout and divaricate, 1-2 inches long, curved, bracteate at summit, and 2-5-flowered, with one of the pedicels bracteate and occasionally 2-3-flowered, central pedicel about double the peduncle; calyx broad and open with broadly ovate to almost reniform sepals, hyaline below and with short acuminate tip, 2 lines long, green; whole inflorescence minutely glandular-hairy; corolla nearly white, abruptly ventricose at the end of calyx teeth to 9 lines wide, conspicuously bilabiate; the corolla lobes broad, 3 lines long, the lower reflexed; sterile filament long-bearded and conspicuous; anthers horseshoe-shaped, explanate, narrow and curved cells nearly 1 line long;

corolla one and one-third inches long. This has been confounded with P. Palmeri of the interior, but is very different. The flowers in the bud closely resemble those of Scrophularia. Keane, California, May 21, 1903.

Pentstemon pseudospectabilis n. sp.

Lower leaves oblong-lanceolate, about 3 inches long, pectinately toothed; stem leaves mostly triangular-lanceolate and very acute, completely connate, mostly entire, the uppermost leaves the narrowest; cymes nearly always sessile, with pedicels 6 lines to 1 inch long and erect; otherwise as in P. spectabilis. This is easily separable from that species by the sessile cymes, narrow leaves narrowest (not widest) above on the stems and by the strict and very narrow thyrsus. It has the same red-purple flowers and nearly glabrous sterile filament and suffrutescent base. Chimihuevis Mts., northwestern Arizona, at 3000 feet altitude, April 23, 1903.

Pentstemon flaviflorus n. sp.

Closely allied to P. strictus, but corolla less ampliate, the lobes shorter, and anthers different; tall, strict and erect, several feet high, paniculately branched above with narrow thyrsus on each stem, apparently glabrous throughout with thick and rigid leaves; the upper leaves only seen, linear-lanceolate, 2-4 inches long, acute, entire, sessile, with cordate base; bracteal leaves reduced to ovate or subulate and very small bracts; peduncles mostly 2-flowered and 2-4 lines long (sometimes 9 lines long and proliferous with the ultimate peduncles like the normal ones); pedicels slender, about 6 lines long; sepals oval, 1½-2 lines long, with narrow hyaline margins, abruptly acute or with a short acumination, about one-third the ovate pod when mature; corolla yellow, 1¼-1½ inches long, proper tube 1 line wide and about double the calyx in length, then rather abruptly enlarged to the throat, which is 5 lines wide and with short and broad lobes, obscurely bilabiate, short-bearded within; anthers exserted, backs of cells forming a straight line as in P. barbatus and half-oval, distinct, ½ line long, glabrous, split nearly to the top; sterile filament glabrous.

Pentstemon pulchellus is a reduced form of P. caeruleo-purpureus.

Gerardia paniculata n. sp.

Annual allied to G. aspera very closely; scabrous, stems several, paniculately branched above; leaves linear-subulate,

2 inches long, little reduced above; flowering pedicels 6-8 lines long, in fruit 18 lines long, erect, rigid; calyx truncate, with minute and subulate teeth; flowers ample 1 inch long, purple and pilose-ciliate. This differs from G. aspera especially in the long pedicels and minute calyx teeth. Marsh Lake, Sierra Madre Mts., Chihuahua, Mexico, growing under pines at 7000 feet altitude. September 19, 1903, and also in San Pedro Canyon, September 16.

Pedicularis Jonesii Brandegee n. sp.

"Stems less than 2 dm. high, glabrous; leaves 5-6 cm. long, mostly clustered about the base, the ovate-lanceolate and sinuate blade equaling the petiole, pinnae linear and pinnatifid; bracts lanceolate, serrate or denticulate, shorter than the flowers; spike one-third the length of the stem; calyx slightly cleft anteriorly, 5-toothed, the teeth minutely ciliate; galea more than twice as long as the calyx, narrow, falcate, attenuate into a somewhat upturned beak; lower lip one-third shorter than the upper, deeply parted into 3 lanceolate lobes of equal length, the middle one the narrower, all lanate-pubescent below. Collected by Prof. Marcus E. Jones at La Palma Jalisco, Mexico, June 9th, 1892. Type in the herbaria of T. S. Brandegee and Marcus E. Jones."

Scrophularia nodosa L. the type has ovate, acute, and simply and finely serrulate leaves.

Scrophularia nodosa var. Marilandica (L.) Gray. The leaves ovate-lanceolate, truncate to cordate at base, deeper serrate.

Scrophularia nodosa var. lanceolata (Pursh Fl. 2 419 (1814) as species). Leaves lanceolate, acute at base, long, simply and low-serrate. This is S. montana Wooton.

Scrophularia nodosa var. Californica (Cham. Linn. 2 585 as species). Leaves coarsely and doubly serrate to laciniate, mostly with acuminate teeth. All these pass by imperceptible gradations into the type. The Utah forms are just intermediate. The shape of the sterile filament of which much has been made amounts to nothing as a character.

Castilleia stenophylla n. sp.

Tall, not shruby, corymbosely branched above, perennial; leaves nearly filiform, entire, 1-2 inches long, the upper linear-subulate, the floral ones narrow and short; spikes short, dense in flower, open in fruit; bracteal leaves similar to the others but a little broader below, the upper bracts narrowly oblong,

acute, red, entire; flowers with green back and red face 1¼ inches long; calyx lobes broadly triangular, nearly equally cleft, equaling the tube; galea stout, 4-5 lines long, one-half to one-third the tube, nearly straight, 2 lines wide at base and ½ line wide at tip, tip 1 line long, closely appressed lobes lanceolate and green; fruit oblong-ovate, 5 lines long, smooth; leaves inclined to have fascicles in the axils. Erect plants 2 feet high growing at Garcia, and in San Diego Canyon, Sierra Madre Mts., Chihuahua, Mexico, September, 1903.

Castilleia ambigua n. sp.

Closely allied to Orthocarpus pallescens and pilosus, but is nearer the former. It has the bracts of the former and the short corolla and long calyx of the latter, but it cannot be a hybrid, because the two species do not grow together, or within hundreds of miles. Spike dense; whole plant softly hirsute: leaves those of O. pilosus; bracts 1 inch long, with linear-subulate lobes, equaling the corolla, not colored nor enlarged at tips; otherwise as in O. pilosus. Soda Springs, Nevada County, California, July 28, 1881.

Pedicularis similis equals P. crenulata.

Collinsia Diehlii n. sp.

A slender annual, branched, erect; leaves linear; pedicels single and filiform, about 1 inch long, minutely white-pubescent but not glandular; calyx tube 1½ lines long and equaling the subulate and very acute lobes which exceed the short capsules; corolla purple, the throat sessile at a right angle and produced above into an almost spur-like sac 1 line high and long, upper lobes much shorter than the lower and reflexed, the lower lobes broad and 3 lines long and surpassing the thin central one, which is smooth and does not conceal the stamens, throat 3 lines long. This seems to belong to the bicolor section, but with filiform pedicels. Oregon City, Oregon, June 13, 1902, Diehl.

Collinsia Cahonis n. sp.

Thyrsoidally branched from base; lowest leaves ovate, long-petioled and obscurely dentate, the blade 6 lines long; all but the lowest stem leaves nearly sessile, oblong-ovate, 1 inch long, obscurely dentate, thin; whole plant pruinosely pubescent but not glandular; uppermost leaves reduced to nearly filiform bracts, which are 4 at each node; normal leaves only 2, not gradually reduced to the bracts; flowers 1-2 in each axil except the very lowest; pedicels in flower about 4

lines long and filiform, in fruit often 1½ inches long; flowering calyx 2-3 lines long, densely-rough-pubescent, with oblong and obtuse lobes equaling the tube, in fruit the calyx enlarges to 4 lines long, is campanulate with hyaline and green-nerved base and ovate to triangular green lobes, surpassing the spherical fruit by 1 line; corolla blue, 4 lines long, the oblanceolate lobes all alike and equal and equaling the slighty declined narrow throat which is a little saccate at base. This manifestly is closely allied to C. callosa Parish, which has thick and fleshy leaves, elliptical-oblong in outline, which are never reduced to filiform or linear bracts above, though the bracts are much reduced; the pedicels and calyx are sparsely glandular; calyx lobes triangular-ovate, longer than the tube, but calyx in fruit only 3 lines long and hemispherical; pedicels stout and 4-7 lines long in fruit; flowers about 3 lines long, with nearly obovate lobes; calyx does not exceed the fruit; growing plants do not look much alike. Tehachapi, California, 1903.

Collinsia parviflora var. minima (Nuttall Jour. Phil. Ac. 7 47 as species). This is a form with flowers 3-4 lines long, being 2-3 times the normal size, and a more robust plant with larger leaves. Elmer's No. 162 from Pullman, Washington, is this variety.

Collinsia Brucae n. sp.

Slender and erect and corymbosely branched from the base; lowest leaves oval, thin, sparsely dentate, long-petioled, the blade 6-9 lines long; upper stem leaves linear, 1-1½ inches long, 2-3 lines wide, sessile, obtuse; the middle leaves are 3-6-toothed towards the tip; the uppermost leaves reduced, but never bract-like; whole plant smooth; filiform pedicels 3-4 lines long in flower and 9-12 lines long in fruit; calyx cleft nearly to the base with linear-subulate lobes 4 lines long; corolla white or yellowish white with speckled upper lobes, saccate at the sessile base and outline obliquely ovate to the limb, the throat about two-thirds as long as the sepals and contracted at mouth, the corolla lobes 3 lines long, longer than the throat, the lateral one oblanceolate and equaled by the broader upper lobes and all 4 lobes fully a line longer than the hairy keel; corolla 4-5 lines long, not greatly surpassing the calyx lobes, declined; capsules spherical about 2 lines long; some of the lowest leaves occasionally 3 lobed; pedicels one to each axil. This would appear to be between C. arvensis

Greene and C. sparsiflora.

Cedronella Madrensis n. sp.

Calyx red, 5 lines long, triangular lobes 1 line long; flowers red 1½ inches long; leaves ovate, cordate, obtusely shallow-crenate, 2 inches long, on a petiole 2-6 lines long, hoary below, green above, the lower one smaller; flowers in one terminal and loose glomerule, or in a short spike 3-4 inches long; bracts small; plants 2-3 feet high with the habit of Lophanthus. San Diego Canyon, Sierra Madre Mts., Chihuahua, Mexico, at 6000 feet altitude, Sept. 16, 1903.

Hedeoma patens n. sp.

Erect perennial from a woody root, 2 feet high, stem slender and nearly simple, minutely pubescent, about the middle producing short and leafy branches which are very slender and floriferous above the middle and with narrowly elliptical bracts 4-6 lines long, and few flowered; upper leaves with axillary and sessile clusters of flowers, only the uppermost leaves shorter than the flowers and pedicels, leaves punctate, short-petioled, oblong-lanceolate, with a cuneate base and blunt tip, obscurely dentate above, nearly glabrous, 1 inch long, thin, not nervose; flowers on filiform pedicels about 4 lines long, rather many, but not densely clustered; calyx tube 3 lines long, the two upper teeth shorter, broader and reflexed, all ciliate; corolla with slender tube about twice the calyx, puberulent. This has the habit of Calamintha. Guayanopa Canyon, Sierra Madre Mts., Chihuahua, Mexico, at 5000 feet altitude, Sept. 23, 1903.

Scutellaria alta n. sp.

Erect, tufted herbs, 3 feet high allied to S. Wrightii; nutlets the same; whole plant minutely pubescent, ashy below, stems slender, paniculately branched; leaves ovate, the lower coarsely dentate, obtuse, the upper triangular-acute and entire, all with cuneate base and stout petiole 2-3 lines long, 3-5-nerved, paler below, 1 inch long; flowers blue, 8 lines long, axillary and single in the axils; calyx not greatly accrescent, 2 lines long in fruit, 1 line long in flower; roots thick, woody and not stoloniferous. Guayanopa Canyon, Sierra Madre Mts.. Chihuahua, Mexico, Sept. 24, 1903.

Stachys camporum n. sp.

Perennial stems somewhat creeping, many, ascending to erect at tip; sparsely pilose plants; leaves narrowly oblong, venulose, crenulate, obtuse, with a contracted base, nearly

sessile, 1 inch long; slender spikes 6 inches long, half as long as the plant; flowers few in clusters which are about the length of the leaves, a part subtended by leaves which are gradually reduced above; calyx nearly sessile, somewhat viscidly hairy, the tube campanulate, 1½ lines long and nearly equaled by the rigid spreading, acerose and triangular teeth; corolla 2-3 lines long, narrow and very small, tube not exserted, purple. This grows on the margins of rivulets and ponds in Mound Valley, Sierra Madre Mts., Chihuahua, Mexico, September 18, 1903.

Salvia Arizonica var. Huachucana n. var.

This is like the type, but the calyx and leaves have raised and reddish brown atoms, and the style is long-bearded like a swab at the end. Near the top of the Huachuca Mts., Arizona, at 7000 feet altitude, Sept. 4, 1903.

Salvia funerea n. sp.

A densely tufted shrub becoming several years old like Audibertia incana; ascending, 5 lines long, tube nearly linear and abruptly spreading, flowers delicate deep blue, the lower lobe of the corolla a little declined, faintly pleated and lacerate and crumpled, the outside lobe finger-like, blue and blunt, the upper lobe with broad and triangular notch with acute tips; calyx greatly inflated and covered with a fine and thick wool composed of much branched soft hairs, resembling pellets of wool 3-4 lines long, 1 in each axil mostly, sessile; inflorescence spicate on the upper half or third of the stems and spikes simple and rigid, leafy-bracted throughout, the leaves reduced gradually but never altered in character; lowest leaves ovate to rhomboidal, folded and deeply creased, very coarsely ribbed, 8-12 lines long, shortly-acuminate at tip, entire, very leathery and hard to dry, acerose-tipped, the subulate brown awn being 1-3 lines long, abruptly contracted into very wide petiole one-quarter to one-fifth the blade, the central leaves mostly rhombic-lanceolate and acuminate at both ends, entire, 1½ inches long, but entire like the lower ones; upper leaves and lower bracteal ones broadly ovate and like the basal ones, but coarsely 3-7-toothed and acerose, about 1 inch long, the upper-most bracteal ones rhomboidal and short; the corymbose branches with white and flaky bark and slender; season's twigs strict and simple, 4-6 inches long, white-woolly, as are also the leaves; internodes 1½ inches long. Growing in dense and rounded tufts about 2 feet high on the hottest volcanic

rocks on cliffs 1500-2000 feet altitude. Funeral Mts., Death Valley, California, April 9, 1907, Tropical Life Zone.

Verbena Aubletia var. Lamberti (Sims. Bot. Mag. t 2200 as species). This is a well marked variety mistaken by collectors for V. Wrightii. It is common in Arizona and New Mexico; is a perennial and has the small glands of V. Aubletia, but is nearly erect and 1-2 feet high.

Boerhavia annulata Coville. This remarkable plant so different from most others of the genus was not well described. It is a biennial, rarely reaching three years old, with thick and almost woody base growing in tufts 1-5 feet in diameter with basal stems nearly 1 inch thick and decumbent, the rest being erect or nearly so, often 4 feet high, flowers open in the daytime, are pleated, campanulate or rather open-funnel-form, five-ribbed, pink-tipped; stamens 3-4, purple, the lower two declined and arched at tip, the pistil conspicuously so and longer than the stamens, the latter exserted fully the length of the calyx (except its narrow base); flowers retrorsely bearded; seed smooth, faintly 5-nerved, pear-shaped; anthers yellow. This grows in loose gravel in gulches in the very hottest places on the east side of Death Valley at 1000 feet altitude, April 8, 1907.

Boerhavia Thornberi n. sp.

Apparently annual, tall or long, widely panicled, closely resembling B. intermedia, but flowers 2-4 in a short raceme, scarcely double the length of the fruit, all on filiform pedicels nearly as long as the fruit at last; flowers minute, ½ line long, pink; stamens 2, exserted; fruit narrowly triangular (narrowly obpyramidal), with short stipe, sharply 5-nerved, squarely truncate and with the ribs projecting in cross-section as knobs, side of ribs rugose, interspaces very small and pubescent; whole plant smooth; upper leaves lanceolate and acute. 1 inch long, short-petioled, bracts 2, subulate, very early deciduous; lower leaves ovate, acute, whiter below, 2-3 inches long; plants erect and annual. Collected by Thornber at Tucson, Arizona, No. 10, Sept. 20, 1903, and also his No. 339.

Eriogonum androsaceum Bentham. The type of this species has leaves 2-5 inches long, oblanceolate to nearly linear, the petiole being nearly half the blade; plants acaulescent; peduncles a foot or less long with a whorl of similar but short-petioled bracts; involucres 4 lines long, deltoid-lobed; rays stout, 1-4-times the involucre; flowers shaggy

with wavy hairs which are variable, very light-yellow to pink tinged, not evidently prolonged to a slender stipe above the joint; the bases of the hairs are intermixed with glandular pustules: the pedicels below the joint have pustular and often scattered long hairs, but are smooth with age. What I take for the type are my specimens from Payette Lake, Idaho, at 5000 feet elevation, July 27, 1899, and Lethbridge, Alberta, collected by Diehl, July 21, 1899.

Eriogonum androsaceum var. Piperi (Greene Pitt. 3 263 as species). This differs from the type in the oblong-oblanceolate to oblanceolate leaves, 2-4 inches long, and the flowers manifestly prolonged into a stipe above the joint and golden yellow. This I have from the same locality as the type and also from the Cuddy Mts., Idaho, at 6000 feet elevation, July 11, 1899.

Eriogonum pyrolaefolium is instantly recognized by the fuscous and kinked hairs of the flowers and intermingled glands and the black anthers. The pedicels are the same as in E. androsaceum. The var. coryphaeum is only a form with flowers 2-3 lines long.

Eriogonum aridum Greene Pittonia 3 200. Greene says of this "perianth of a dull cream-color decidedly narrower than in the allied species," "angles" of akenes "retrorsely hairy at summit." "Peculiar to the arid foothills above the Humboldt Wells." "Quite distinct from both" E. umbellatum and subalpinum "in floral character and belonging to a dry desert region where neither of these species occurs or would be expected." Now any collector of E. umbellatum knows that the flowers vary in every mountain range from nearly white to golden yellow and generally turn pink with age at all elevations, and that in fruiting specimens like Greene's the sepals elongate and become cuneate, and that retrorsely bearded akene tips are almost generic. There is not a character given for this species that E. umbellatum does not have. Furthermore, Humboldt Wells is not a dry desert region; the humidity there is greater than at any point between the Sierra Nevadas and the Oquirrh Mts., Utah. This species is not peculiar to that region and E. umbellatum is very common there at all elevations, while E. subalpinum undoubtedly occurs on those mountains, as it is everywhere on the moist tops of the high mountains in the Great Basin. This same proposed species occurs on Star Peak, western Nevada, at 9000 feet elevation,

along with the other high altitude forms, and also high up in the East Humboldt Mts., Nevada, the north base of which is Greene's type locality for this proposed species. It also occurs in the Henry Mts., Utah, at 10,000 feet altitude, and at various places in eastern Nevada at 6000 feet.

Eriogonum dumosum Greene Pittonia 3 199. Greene says of this that it is 5-6 feet high (?), akenes very prominently angled, and that E. umbellatum is always a low and caespitose undershrub, seldom or never a foo thigh. There is not a single character given by Greene for his species that is not found in the latter, the so-called "excellent technical character" of a "very prominently angled akene" not excepted. I collected his proposed species, which was about 2 feet high at Susanville, California, having all of Greene's characters and in addition very long rays. It is simply a robust form of E. umbellatum; the young flowers are often very short and broad.

Eriogonum angulosum var. Victorense n. var.

A close ally to the type having the same bracts and fascicles of leaves within them and the habit of gracillimum, with long racemes and filiform and curved pedicels 1 inch long; whole plant almost glabrous, but the underside of the leaves floccose; leaves broadly to narrowly oblong and acute; sepals narrow, 1 line long, not saccate, enlarging above, spreading, crose, pink, the flowers are double the size of the type and are much narrower and there are intergrades with gracillinum. Victor, California, May 18, 1903.

Chorizanthe floccosa n. sp.

This is near to C. Californica; stem leaves oblong, nearly sessile acute; whole plant woolly, the scattered heads densely so; bracts ovate, acerose-tipped with short and straight awns, flowers very small; involucres densely woolly forming an ovate mass, with very short awns and hyaline margins. Bakersfield, California, May 3, 1903.

Polygonum. The revision of this genus by Small at first sight gives a person great pleasure because of the ample pages, fine letter press and engravings, but when one attempts to use it in the identification of species it is most unsatisfactory because the new species proposed are mostly fiat species, while the drawings correspond neither with the text nor to the species as they exist in nature, the stipules and akenes of the drawings are particularly the products of the imagination; though the writer has plenty of material of P. tenue both from

the east and west, he has never seen a specimen like the figure of Small's and seriously doubts if anybody else saw one; the leaves are figured as having awns at least 3 lines long, which is not the case with the species. P. Douglasii Small splits up into at least three fiat species. There is a complete transition from Douglasii proper through Sawatchense, Engelmanni, Austinae, to Douglasii var. montanum, which equals the variety latifolium. The character of tenue having 3 parallel-nerved leaves given by Greene holds good; all of Small's other so-called characters fail, such as thickish leaves, erect flowers, stipules. The ciliolate-scabrous leaves and stems are not more so than many specimens of Douglasii, though usually tenue is far more lacerate-fringed on the leaves. The mid-nerve of tenue is mostly rounded and but little raised, while in Douglasii and all its varieties it is also conspicuously winged, though less so in the variety montanum. The leaves of tenue are thinner than Douglasii or any of its forms. Douglasii has pinnate-veined leaves, and flowers 1-2 lines long, erect or reflexed; the **var. montanum** (Small Polyg. 118 as species) has large flowers, oblong-ovate akenes which do not differ. P. Sawatchense is a form of Douglasii with smaller flowers.

Polygomun Douglasii var. Austinae (Greene Proc. Cal. Acad. 2 212 as species) is a small form branched at base and with proliferous and almost filiform stems with broad and large basal leaves greatly reduced on the branches. P. Engelnanni Greene is an intermediate form. The short stipular sheaths elongate just as the stems do; if the stems are very short with almost no internodes then the sheaths are very short, and so that character is of no value. P. Kelloggii and Watsoni are forms of the same species, the distinctions do not hold in any particular.

Polygonum phytolaccaeforme Meisner Small is described by Small as "drying black, leaves obtuse or slightly cordate at base, flowers in rather loose lax spikes which are about 1 inch long, akene oblong chestnut-brown." Now it does not dry black except as any plant will if neglected in the press by a lazy collector. The leaves are neither obtuse nor cordate at base, the flowers are panicled as in P. alpinum, and the ultimate racemes are 6 lines to 2 inches long, akene never oblong, normally straw-colored. Small on page 34, figure 4, represents the leaves as acuminate at base and the akene as ovate,

which is correct. He described P. alpinum as having akenes broadly ovoid or oblong and figures them as broadly elliptical, neither of which is correct. The akene is almost round and broadly ovate. The cross sections of both are wrongly figured, the sides being deeply concave and winged at the angles. He figures the leaves as too narrow. The var. foliosum is the broad-leaved form not deserving varietal rank. P. phytolaccaeforme has not a character to stand on except the small and ovate akene, which is probably accidental.

Atriplex elegans var. Thornberi n. var.

Bracts deeply gashed and with two digitately divided processes, nearly as long, at the base of the bract; stems ascending, 1-2 feet high; this is the most extreme form. Tucson, Ariz., Thornber.

Atriplex elegans var. fasciculata (Watson Proc. Am. Acad. 17 378 as species). This is a form with minute teeth and depressed habit.

Atriplex elegans var. coronata (Watson Proc. Am. Acad. 9 114 as species). This is the common form with deeply gashed bracts and smooth sides; it is tall and possibly endures over a year at times as the type species appears to be occasionally biennial at El Paso, Texas, but is mostly annual westward.

Euphorbia Rinconis n. sp.

This has the habit of E. Fendleri: perennial with few and prostrate stems dichotomously branched from the base, only the upper internodes shorter than the leaves, stems about 4 inches long; leaves very oblique, entire, revolute, sessile, triangular-cordate to triangular-ovate, acute, 3-4 lines long, rough-ashy even to the pods, opposite; flowers axillary and unilateral and in short leafy racemes; involucres campanulate, nearly sessile; glands reniform, large, green, destitute of appendages, or with the merest rudiments; pods 1 line long, acutely angled; seed oblong-ovate, 4-angled with concave sides mostly smooth, but dull and rarely obscurely undulate. This appears nearest to E. Fendleri and polycarpa, but differs from the former in the pubescence, acute leaves and few stems, and from the latter in the ovate and large leaves, few branches, rough pubescence, lack of appendages, large pods and involucres, and smooth seed.

Celtis occidentalis var. reticulata (C. reticulata Torrey Ann. Lyc., N. Y. 2 (1828) 247 as species).

Betula microphylla var. fontinalis (Sargent Bot. Gaz. 31 239 as species).

Betula microphylla var. occidentalis (Hooker, Fl. Bor. Am. 2 155 as species).

The true Betula microphylla occurs in Montana and intergrades occur in Montana and Utah with the var, fontinalis. B. Piperi Britton is an intergrade between the species and the var. occidentalis.

Salix Jaliscana n. sp.

Allied to S. laevigata; leaves elliptical-obovate to oblong-lanceolate, 2-4 inches long, dark and dull and prominently yellow-veined above, very glaucous and slightly pubescent below, minutely and finely and closely serrulate and revolute, only the narrower leaves acute or shortly-acuminate, petioles glandular and 2-3 lines long and stout; stipules none; season's twigs yellow and woolly, older ones dark-reddish-brown and smooth; catkins (male not known) very dense, broadly linear, 1-2 inches long, on long and leafy peduncles on which the upper leaves are longer than the catkins and obovate and narrowed, but truncate below (which is the same in all the leaves); pods rhomboidal-obovate, 1 line long, smooth and corrugated with age, but probably deciduously woolly when young; stipe nearly as long as the pod and very woolly; scales oval, about ½ line long and very persistent-woolly; styles evident, about as long as the very broad stigmas; a rather large sized bush. Ferreria Jalisco, Mexico, May 28, 1892.

Zygadenus venenosus var. ambiguus n. var.

Inflorescence panicled. This is the Californian form west of the Sierras, though connecting forms occur at Reno, Nevada.

Zygadenus intermedius Rydeberg. Rydberg's description of this species has these features: All leaves with distinct sheaths, petals long-clawed, oblong, 6-8 mm. long, easily distinguished from Z. paniculatus by the obtuse petals, distinct claws, and sub-cordate base of petals. Part of his type is my No. 2091 from Farmington, Utah. These specimens have no distinct sheaths to any of the leaves except the basal ones, the petals are short-clawed, ovate to rhomboidal, and some at least are acute, 4 mm. long, they are not easily distinguished from Z. paniculatus by any character given by Rydberg, but being typical Z. venenosus they are easily distinguished from

paniculatus by the absence of sheaths and by the only simple racemes, as well as by the habitat which is a wet meadow, while the other species does not grow in wet meadows. This is a fair sample of Rydberg's accuracy in dealing with Zygadenus. There is absolutely no character to separate venenosus from paniculatus but the absence of sheaths to the stem leaves and the habitat. The perianth varies from 1½-4 lines long, from hyaline to green, from long-clawed to short-clawed.

Zygadenus Fremonti var. brevibracteatus n. var.

This differs from the type in having very narrow leaves, small flowers about 3 lines long, ample and compound racemes, 1½ feet long, stout and horizontal pedicels 12-18 lines long, ovate-lanceolate bracts about 6 lines long; plants 2 feet high, growing among rocks. This is not the variety minor, but is a desert form of this well known coastal species. Growing among rocks at Victor, California, on the Mojave Desert, May 18, 1903, at 2900 feet elevation.

Calochortus Nuttallii var. subalpinus n. var.

Base of anthers sagittate, body linear but narrower above, 2 lines long; pods lanceolate and deeply sulcate, 1 inch long; stems 2-3-leaved; petals rhomboidal, very obtuse, light-purple, or purple-veined to nearly white, with a variable purple spot near the base. There are two forms, one of which is low with flexuous and short-stemmed and umbellate flowers, the other with tall and simple anl 1-flowered stems which are barely flexuous and erect. This grows on the high ridges at Summit, and on the mountains back of Susanville, California, at 6000-7000 feet altitude.

Allium Davisiae n. sp.

Plants 1½ feet high, erect, strict and rather stout; leaves 2, 6-8 inches long, narrow, not flattened, nearly straight; stems round and not winged nor enlarged at tip; bracts 2, oval-ovate, 6 lines long, acute, thin and colored; pedicels stout, 1 inch long, thickened above, 20-30, in a dense and hemispherical head; flowers campanulate, white, green-ribbed; sepals green-ribbed and tipped with red, oval and acute, rather rigid, 2½ lines long, not spreading, ½ longer than the stamens; filaments deltoid at base; capsule glandular, wholly without crests, 2 lines long, with depressed tip; seeds 1 line long, ovate, black, rugose and finely pitted; bulbs deep seated, yellowish-brown, ovate, 1 inch long, propagating by division at the base, clustered, of several alternating coats of

very thick and very thin scales, the thick ones with fine and raised and rectangular transverse meshes with straight sides much like those of A. obtusum (see the last figure of A. obtusum in the lower right hand corner of plate in my Contributions No. 10), but scales very thick and nearly opaque and yellowish; the thin coat is probably the inner membrane of the thick coat, the meshes are faint, vertical, and rectangular. It has the strong odor of leeks and grows in gravelly granite soil and among rocks at Victor, California, May 8, 1903, at 2900 feet elevation, in the Tropical Life Zone. The thick scales are horny. It appears to belong to the anceps group, but differs from all its allies.

Allium hyalinum Curran seems to be much confused. Specimens got for me by Mrs. Brandegee's suggestion at Riverside, California, in April, 1905, show that the sepals are oval, obtuse, 7-9 mm. long, 4-4 mm. wide, red-purple-veined, white; stamens two-thirds as long as the sepals with filaments gradually widened below; ovary crestless, becoming a depressed and globose pod; pedicels stout, 2-4 cm. long; bulblets occasional in inflorescence; bracts 2; rhombic-lanceolate, acuminate, 1 inch long; flowers broadly to narrowly campanulate, nearly white to suffused with purple, about 25-30; leaves 2-3, flat, tapering to a long point, 2-4 lines wide, nearly as long as the stems, 1 foot long; the roots propagate by division, oblate-spheroidal to ovate and the latter when young; stems stout when fully developed, 18 inches long; with age the flowers close and are inclined to be contracted above the ovary fresh bulbs are 1 inch wide and ¾ inch high.

Allium reticulatum var. playanum n. var.

This variety includes the forms growing on dry foothills and plains, Pocatello, Idaho, Red Desert, Wyoming, and the region south of the Uinta Mts., Utah. They have rather rigid and rather glaucous leaves longer than the scapes which are 6-12 inches long; pedicels rather stout, 9-12 lines long; flowers many; crests low and blunt as in the type species; sepals ovate-lanceolate, 3 lines long, not lax; bulbs about 2 inches long. Lower Temperate Life Zone.

Allium reticulatum var. deserticola Jones comprises the forms with short scapes about 6 inches long and longer than the leaves; large bulbs; long sepals and pedicels; very large and acute crests often nearly half as long as the ovary, generally covering the entire top of the ovary as a spongy mass.

Lower Temperate Life Zone, found also at Skull Valley, Arizona.

Allium reticulatum var. Nuttallii (Watson Proc. Am. Acad. 14 227 as species).

This comprises the forms with red and rather rigid flowers with short pedicels, rudimentary crests and flaccid leaves shorter than the slender stems which are about 6-18 inches high; bulbs small. This grows in the Middle Temperate Life Zone from the Mimbres Mts., New Mexico, and in Arizona to British America, on the Great Plateau only, at the south it grows on low mountains. This is A. dictyotum Greene.

Allium peninsulare Lemmon has been positively identified by Brandegee as A. serratum, and so what I have hitherto called that species becomes A. praecox Brandegee.

Commelyna dianthifolia var. filiformis n. var.

This is more slender and less leafy; tail beginning abruptly 9-12 lines from base of spathe and continuing 1-2 inches at about the same width or sometimes enlarged toward the tip into a pseudo-blade, but mostly it is not over 1 line wide throughout; peduncles almost never exserted beyond the spathe and usually are represented by a mere filiform rudiment recurved from base of the spathe; roots rarely over 1 inch long. This is well represented in my herbarium by many specimens, Arizona, New Mexico and Mexico. No. 263 of Townsend & Barber from near Garcia is one. It grows in higher and more moist places, and is common.

Tradescantia petiolaris n. sp.

Annual, erect; all but the uppermost leaves short-petioled, ovate, about 3 inches long, thin and flat; spathes loose, 3 lines long, hyaline; flowers terminal, 3, 6 lines long; pedicels stout, pubescent, 1-2 inches long; sepals lanceolate, pubescent; plants 1 foot high, glabrous except as noted. Guayanopa Canyon, Sierra Madre Mts., Chihuahua, Mexico, 6500 feet altitude, Sept. 16th, 1903.

Carex Tuckermanni is of Dewey and not Boott as is usually given. It was published by Dewey in Sillimann's Journal 1 49 48 (1845).

Oryzopsis Kingii var. latifolia n. var.

Much like the type in habit, but leaves 2 mm. wide when flat, and 1 mm. wide when involute; culms about ½ as high (12 inches high, excluding the equally long inflorescence); in-

florescence that of O. fimbriata, not appressed nor strict; awns half as long as in the type and plumose on the lower half, bent but once. Chat Nevada, 5000 feet altitude, June 18, 1897.

Cheilanthes gracillima var. aberrans n. var.

Ultimate segments nearly round, whole under side of frond densely rusty colored with very narrow and long-acuminate scales, also somewhat hairy below; fronds 4-6 inches long, narrow. This would seem to be a good species between gracillima and Fendleri, but as C. gracillima grows within five miles of it, and as the other species does not grow within hundreds of miles, it cannot be a hybrid.

NOMENCLATURE AND BOTANICAL SYSTEMS.

It has now been some fourteen years since the Brittonian system was railroaded through the Botanical Club of the American Association for the Advancement of Science under false colors as a "list of the plants" after packing the club with the adherents of the scheme and so fixing it that the real botanists of the country were never appealed to to authorize it, nor even the members of the Association as such, the subject never having been put to a vote of all the members, but this system has been put out by its adherents as that of the Association. The primary object of the scheme was well known to be the boosting of a certain book published by the chief originator of the plan and incidentally to try to take from Harvard the supremacy in botany. Whatever may have been the motive for it the botanical public would have acquiesced had the nomenclature presented been based on sound principles, but it was not. It was claimed to be a panacea for all nomenclatural ills. Its practical application by its adherents instead of making nomenclature stable, opened the flood gates for change and since its adoption has made something like 50,000 changes and new names where a possible 1,000 or 2,000 would have been ample under the old rules. It professed to be a simple revision of the names of the plants of a restricted area of the U. S., but when finally set before the public it was not only a new system of nomenclature, but a new botanical system as well, whose chief object was to completely upset the whole fabric of modern botany, changing the point of view with no compensating advantage.

The avowed object of the system was to avoid the use of common sense and in its place give a rigid legalism without exceptions, but before the system had been in use to speak of Britton himself violated it (see Robinson's criticism).

Its chief virtue was in a rigid adherence to priority. Ward in defending it, quotes Jordan with approval when he says that if you do not use the first name applied to a thing then you can use any one you wish, a specious argument seemingly conclusive, but in fact absurd. When we come to examine this in its application, we find that it isn't priority if it goes back farther than 1753, and it is not priority if it is not in the Latin language. If there is any force in the so-called priority it

should apply for all time and in all languages. The writer has found some 150 species and genera described far better in Sanscrit than most of those of Linnaeus. The English language is full of well described species and genera which have as much right to recognition as any others in the Latin language which were published long before the present Latin combinations were made. If it is contended that the common terms are not Latin we can easily follow the lead of Britton and put a Latin tail on them (a la Manihota Britton for Manihot). In that case we would have such very attractive combinations as the following: sagebrushum tridentatum, Brittonastrum tumbleweedum, Greenella slipperyelma, Rydbergionella bitterroota, Covilla creosotebusha, Nelsonella greasewooda, etc. These would be fully as euphonious as some of the recent combinations and far more expressive, and would not stretch the great rule of priority to the snapping point. The sensible rule adopted by botanists (with this one exception) is to take 1753 as the starting point for species and to recognize any proper and some improper Latin combinations for species in each genus if accompanied by a description however short, following priority within the genus. This prevents all the names injected into genera by the Brittonian rule which requires the upsetting of any name in a genus in case any species or variety is transferred to it from some other genus which happened to be printed first.

In the matter of priority of genera the Vienna Congress took the sensible view by saying that all genera in common use should not be displaced by prior genera not in use, and to accomplish this they excepted from the rule of priority some 800 genera and should have put still more into that category. This again did away with very many Brittonian names.

In making the arbitrary rule of once a synonym always a synonym the Brittonians made a fatal mistake, which the Vienna Congress did not sanction.

In the matter of the manner of publication the Brittonians also made a serious blunder by insisting that the publication must be made in a certain way or it was not valid, which resulted in the squabble between Britton and Greene over Jacksonia. In the judgment of the writer the Vienna Congress whose work was so admirable in most respects made a still worse blunder than the Brittonians when it insisted on the publication of all descriptions in Latin. Such a ruling should

never be recognized by anyone and doubtless will be disregarded as it ought to be by most botanists. No technical rule like that of the Brittonians or Vienna can ever invalidate the work of any botanist who first recognizes a plant in the right genus. Because he cannot write Latin is no reason why his results should not be considered. It certainly is a great convenience to have descriptions printed in Latin, for those who can read Latin, and it is a nuisance to have descriptions published in any other except the tongue of the reader, but it is wrong to carry the inconvenience to the point of invalidating botanical work so published.

The most pernicious thing in the judgment of the writer is the wholesale splitting of genera which has become the substance of the Brittonian system, since it vitiates the very purpose of scientific research. The purpose of science is to clarify, to arrange in the genetic order, to make the complex simple, to make the difficult easy, to clear away the rubbish so that those who follow us can take up our work where we left off and ultimately bring out all the underlying facts and explain causes of natural phenomena. There is no one mind that can carry even a small part of the botanical facts in systematic botany, no one mind that can carry the genetic relationships of plants without grouping them. The object of botanists since the time of Pliny has been to so arrange facts that the student and worker in Nature can grasp and hold them. One system has fallen before another. Linnaeus made a great step in advance when he invented his system based on stamens and pistils which grouped related plants in a marvelous way to the men of his time. But that has fallen before the system of Bentham and Hooker and those who preceded them, while this has again given way to the last so-called natural system which brings related species and higher groups still closer together so that they can be most easily grasped and the facts of genetic relationship better understood. A most admirable system has been thus gradually built up historically. The family and subfamily combine the greater groups but the key to the whole is the genus which has obtained since the time of Linnaeus and even before. This has held the middle ground between the species and the family. What the family and the subfamily are to the higher groups the genus and subgenus are to the middle groups next above the species. One can readily see what havoc the raising of the subfamily to the

rank of family would do. There are as it is too many families for the mind to hold them readily and it is very difficult for any botanist to get and keep a clear idea of them even with the higher arrangement of spermaphytes, etc., but to split the families up into about a thousand by raising every subfamily would spoil the balance now nicely adjusted between the groups and cause endless confusion and in addition be wholly unnecessary. But here we have a fad being adopted by a certain group of botanists which does this very thing with the genus and which can cause nothing but confusion and is causing great annoyance. The reason it was not adopted long ago for the subfamilies was because the personal nomenclature does not obtain in this group, but it has been the custom to attach one's name to all new specific names and thus a man can get immortalized by wholesale by changing the genus name which requires attaching his name as a tail to all such combinations. This is the sum and substance of the new fad for it has no other justification. It has been the custom for nearly two centuries the world over to keep allied groups in genera as subgenera, which enables the student to readily grasp their relationship, but now come the Brittonians and reduce the genus to the subgenus and often even to a single species, making new genera of them and thus throwing them into the subfamily and causing endless confusion there with no compensating advantage. Good illustrations of this are in the splitting up of Aster, Aplopappus, Bigelovia, Astragalus, Habenaria, Peucedanum, Cymopterus, etc. For the same reason the historic variety which will ultimately reduce the genus to the species as now understood and species to variety as now understood, thus changing the whole botanical point of view but altering no botanical fact nor adding one jot to the sum of botanical knowledge, and all because it gives a man a chance to make himself a botanical nuisance of the first order and notoriously immortal by thrusting his name before the student perpetually when otherwise it would never have emerged above the waters of oblivion. It would be far better to do away with the personal nomenclature altogether and then the author of any botanical work would be remembered only for the good he has done. A stable nomenclature will do this, but the Brittonian system will never get through its changes. The whole matter is the result of what philosophers and scientists everywhere condemn, namely, the misapplication and use of well estab-

lished terms, and the consequent change in the point of view. In other words the trouble lies in using the word species (which has a well established historical application) to cover varieties and forms and in degrading the genus to cover subgenera and even very distinct species. This leaves the historic term "genus" and "generic relation" without a name and throws it into the subfamily where it will have to have a new name eventually to separate it from the subfamily. This will bring us back to our starting point after wandering for years in botanical fog and causing the change of several hundred thousand names, and a complete readjustment of the great mass of botanical knowledge to the new point of view, and in return for it we shall get the questionable advantage of having the variety called species, without as I have said, adding one title to botanical knowledge. It is indefensible to shift the application of the generic and specific terms as historically established. A datum point when once established should never be altered or you vitiate the whole body of observed phenomena as referred to that datum point. Those people who change the point of view must not forget that there are certain unchangeable farts of relationship that exist which practically make up the sum total of botanical knowledge to date and they must be recognized, and cannot be altered by throwing botanical dust, or in changing names.

This change of the point of view is well illustrated in the work of De Vries. It is freely claimed that he and others have created new species by certain selections. Before we admit this it is well to see if they know what a species is. There is no evidence that they do. Most of their species are nothing but varieties and many of them poor ones at that. But the excellent work of De Vries and its great value to botany, are not at present under review.

PRESIDENTIAL ADDRESS.
Utah Natural History Society.

The Factors of Climatic and Geographical Distribution.

These factors are of four kinds; external and internal, positive and negative. The external factors are relative humidity, temperature, wind movement, and soil, and are arranged in the order of value. The internal factors are plant structure, organs, vitality, and shape and size of the plant. Each of all these factors may be positive or negative, that is, favorable or unfavorable to the life of the plant. It goes without saying that a moist and warm climate with a rich, loamy soil will be far more productive than a dry and cold climate with a clay soil. Even a novice would hardly expect to find the same vegetation on cliffs as in meadows, or on mountain tops as in valleys. There are other facts, however, that are not so well known, for geology shows that our climate has been subjected to great changes so that the perpetual summer of the Tropics has disappeared, and with it have gone the elephants, tigers, Tropical birds and plants which once were here. To the student of Nature it is an axiom that vegetable life must be in harmony with its surroundings, and that as the climate changes the species must change, move out or die. So he expects to find evidence of the hand of Time in the life of a region, and is not surprised to see the birds and deer migrate, the bear hole up, and the squirrels burrow and store food, while in the plants which can neither burrow, hole up nor migrate he counts on finding devices for protecting themselves against destruction, and for propagation and distribution

In the moist Tropics where all the climatic elements are favorable we find a region of dense and luxuriant vegetation whose only negative factor is a struggle for life between species, a struggle for light, air and soil, this results in a slender habit, and an abnormal number of perennials, climbers, trees, parasites and epiphytes. In the dry Tropics the absence of humidity turns almost every other factor into a curse and so the struggle of species ceases and every device of Nature is used to keep life in the plant. This produces thorny, starved, stunted and fleshy perennials, and multitudes of annuals. but these are not able to cover the nakedness of the drifting sands or crinkling deserts.

Of all the climatic factors relative humidity stands first, indeed there is a greater change in the life of a region by its presence or absence than is found where all other factors combine to favor life. Where the humidity is high there we find luxuriant life, and it matters not whether it is on plain, slope, or mountain, whether in the burning Tropics or around the Frigid Zones. There the air is melodious with the songs of birds, and the land teems with life. Where the humidity is lowest there is a complete change in the plants and animals, the least life, and the stillness of death. There we find the desert wastes from the Tropics to the Poles. As the humidity varies so does the life, and so do the devices of self protection increase inversely with the humidity. Since the humidity of a region is governed by the proximity of bodies of water and their size, by elevation, drainage, wind movement and the presence or absence of lofty barriers which condense the air moisture on one side or the other, we find it inexpedient to use humidity as a means of separating the life of regions geographically or topographically. We therefore take the next lower factor which is temperature.

Temperature is of two kinds, seasonal and annual. In the Tropics at sea-level the temperature is always above the minimum growing temperature, and so the vegetation has to make no provision of moment against such changes, but as we ascend the mountains or move out of the Tropics toward the Poles all plants are subject to seasonal changes. In the Tropics, though there are no temperature seasons, there is a period of rest due to the lessened rains, called the dry season, and a period of activity due to abundant rains, called the wet season. In the Tropical deserts what there is of the wet season determines the growth of plants and has caused the highest development of herbal ingenuity in the annual, which starts up promptly from the little seed safely hid in the ground, blooms, fruits, and dies in a few days, and the wind scatters its seeds and leaves no trace behind. All the protection the plant needs is for the little seed which is so small that it will readily pass unobserved, fall into almost any crack, and be safely hid in a few days by the drifting sand or settling dust, and because of the absence of moisture it will remain secure even for many years. It often happens that no moisture falls on the deserts for several years, but it makes no difference to the vegetation, it sleeps on, awaiting the call of the livening showers. There

are other times when there is more than one wet season in a year, in this case the vegetation goes through a generation at each period. In the separation of Tropical plants into annuals, biennials, perennials, shrubs and trees, the causative internal factor is power to resist dryness, and the same external factor is humidity, since the temperature does not vary enough to be considered. Since the changes of Tropical plants must be due to the humidity and the struggle between species so far as the climate of today is concerned, and since we can see no other factor in past time except the lessening amount of carbonic acid in the air whose effect would be proportional throughout the world, we find less change in its flora than in that of the other zones; we assume that the origin of life was in the Tropics and that from its species have sprung the plants of the Temperate Zones.

In the Temperate Zones we find an added factor to produce seasons, namely, cold. As we pass out of the Tropics dryness as a seasonal factor gradually disappears and cold takes its place. This cold need be only of such a temperature as to stop the life processes in order to cause a season of rest, and the continuance of this condition will measure the relative lengths of the growing and resting periods. On the border land of the Tropics we find both cold and dryness as rest factors and thus there are frequently two seasons in a year, the spring growth and the fall growth, there being a rest period from dryness in the summer and another from cold in the winter. An effect which we find in this region is shown by plants which are annuals farther north become perennials here.

The annual temperature in the Temperate Zones has a marked effect on the vegetation, for the flora gradually changes as the cold increases. Near the Tropics the variety of forms is endless but as we advance poleward the variety decreases and the number of individuals increases till near the poles we have very few forms, nearly the same the world around, but myriads of individuals. It is not always easy to see why a decreasing temperature alone produces such a monotony in vegetation. In the Tropics the heat is such that the species will be changed throughout the entire gamut of life by a varying humidity which is caused by topography chiefly, while in the North the cold is great and the relative humidity therefore always high in the growing season, because of the storage of moisture in ice and snow during the long winter, and the inability of the

heat of the short summer to dissipate it. In addition the effect of topography which is so great southward is largely nullified by the cold covering with a perpetual mantle of snow most of the mountains where a diversified flora would alone be possible.

Since cold is the chief factor in this latitudinal distribution we expect to and do find the same changes as we ascend from the sea to the mountain peaks. This change has been noted from time immemorial by all acute observers. Humboldt long ago laid down the general facts in his life zones which he calls Tierra Fria. Tierra Caliente, etc., by which for generations we have had the life of the world divided into Torrid, Temperate and Frigid Zones. There is little to add to this except in details due to topography and the subordination of the Frigid as a subdivision of the Temperate Zone. Of this phase of the case my address of a year ago dealt, and need not be mentioned here except to furnish you the results in my schedule of zonal distribution appended.

The soil of a region has an astonishingly small influence on the vegetation chemically, for plants take up but a very minute quantity of solid matter and can generally find what they need in any soil, but the abundance of the needed matter affects the luxuriance of growth. Whatever effect the soil may have on the vegetation, it is independent of life zones, since any kind of soil may be found in any zone. The abundance or scarcity of carbonaceous matter in the soil (which is simply the legacy of former growths) has a marked effect on the size and quantity of plants, and the presence of even small percentages of soluble alkalies seriously affects the kind of vegetation, as is shown in the flora of the alkaline deserts, but on the whole the influence of the chemical quality of soil is least of all the factors. The chief influence of soil in its mechanical structure. A clay soil is poor chiefly because it is dense and difficult for roots to penetrate it, and because it is almost always found on flats which have no proper drainage. The same physical elements in the shape of sand and gravel form the chief arable land of Utah, because of their porosity, ease of drainage, etc.

The wind movement has but a slight effect on the character of the vegetation but it has a marked effect on the distribution of species. The chief effect of the wind is the wide distribution of species by the transportation of seeds. This

causes a rapid scattering of certain plants along valleys and over plains and brings prominently into view the effect of barriers and the consequent distribution due to topography. But even lofty mountains are not always efficient barriers against the wind as the higher we go on a mountain the stronger is the wind. This is shown well by its curious effect on trees growing on elevated ridges. Some naturally large trees are flattened out in their growth so that they become creepers instead. During the winter the fierce winds pack the snow around the lower branches and preserves them while above the top of the drift it drives the fine particles of ice so hard against the exposed twigs that they are cut or cracked off and so the tree does not extend upward but spreads over the ground and at length forms an impenetrable mat wholly unlike the nature of the tree. Illustrations of these are shown in the two photographs appended.

Another valuable factor and similar in effect to the wind is the distribution by streams and rivers. The difference between them being that the wind carries the lighter seeds and those specially fitted for floating in the air in all directions as far as the barriers, but the water transportation carries seeds of any size and in only one direction.

Since fleshy fruits cannot be distributed by wind and in only one direction by water, there would be a dearth of these most valuable plants were it not for birds, especially those without gizzards. The birds are not greatly affected by barriers unless they are very extensive or high, while the seeds carried by birds are more liable to be dropped in suitable places since the carriers are most likely to spend more time in similar places to those in which they found the fruit. Other animals, especially those with fur, are ready means of carrying fruit and its seeds, and particularly other seeds covered with gum, resin, barbs, or hooks, but such distribution is greatly affected by barriers. All the above methods of distribution are the principal ones as to rapidity. The slower methods are those by stolons, offshoots, runners, etc., and are necessarily local.

Barriers are of various kinds, the most important are vast areas of a similar flora such as a great and moist plain whether a prairie or forest, hot or cold, a great desert, or lofty mountains covered with different floras. It matters not how many seeds are transported for if they do not fall where the climatic

conditions are similar to that of the place from whence they came they will perish, and so the barriers will be effective. There are some peculiar features produced by barriers, which often puzzle the novice, and seem to upset the system of life zones, for we often have a desert and a humid flora side by side, and even a lower flora above an upper one. In all lofty and well watered mountains which rise out of arid plains, ever canyon with a stream in it carries a long tongue of the upper floral zone far down and sometimes entirely through the flora that lies below it. This is due to the stream and the cold and moist air currents which completely alter the normal climatic conditions in the canyon. Just the reverse of this effect is seen on the cliffs and steep south slopes of the same canyon, for there we see the desert flora running far up the mountain side in a reversed tongue, so that desert plants are actually found far above the species of the next highr zone. This latter is caused by a local dryness due to excessive drainage and abnormal day heat.

The chief changes in a flora are due to the falling of seeds in places with a slightly different climate, to steady changes of climate due to the recession of the equinoxes, to elevations or subsidence of vast areas of land and the resultant alterations by drainage, or the production of lakes and swamps, or great mountain chains. These of necessity change the humidity and temperature and require that the life shall change correspondingly, migrate, or be exterminated. The alterations in the flora will be in their nature internal and made with a view to the preservation of the species by resisting harmful climatic influences, or the propagation of the species by utilizing the various means of distribution. To the student of Nature these alterations are like the fossils in the rocks, means of reading the history of the world back to periods untouched by books or tradition. For example, the early spring flora tells us of an alpine or frigid vegetation which once existed here but which is now represented only by a remnant. An abnormal number of annuals tells us of a former desert flora. Plants with seeds or pods covered with hooks, barbs, or gum tell us that they were created after the animals existed which have suitable hair or feathers for transporting them. Fruits point directly toward the preservation of animal life.

The most interesting phase of life is in the devices employed for resisting seasonal and climatic changes. They are

remarkable for their simplicity and effectiveness, and sometimes produce seeming anomalies. We know that all plants of the Temperate Zone show a flexibility or changeableness whose intensity varies with each species and generally with the extent of distribution of the species, but it is always confined within very narrow limits when we consider the factors with which the plant has to deal. When any change occurs that is great the plant dies. We know with reasonable certainty that for several thousand years there has been no appreciable change in our climate, and as there is no evidence of an internal power of change to produce development in plants such as we see in the human race, we infer that for a long period the flora has been practically the same as now. This view is strengthened by the fossils found in the Pliocene Tertiary formation in Payette river region, and the still more recent fossils of the Bonneville beds of our region. The species are nearly the same as now though many of them pass under different names from lack of a proper comparison with the present flora. As the squirrels hole up and the bears hibernate and so exist far to the north of the place of their origin, so we find multitudes of plants which throw up herbaeous stems and luxuriate in the balmy air of summer, storing up nourishment in their roots, and when fall comes they fold their dead stems over them and lie dormant in the most intense winter's cold only to come to life again in the spring. The same tendency is shown in the shrubs and trees which drop all their leaves and thus greatly reduce their resisting surfaces during the winter. Anomalies occur in the pine family which exist in the very places where we would least expect them, and they still further surprise us by growing almost within the Tropics, although they are scarcely found at all in the deserts where their leaf structure would seem to be specially useful. In a region like ours plants have a double danger to face, the cold of winter, and the dryness of summer. This is admirably provided against by the segos, onions and the like, which bloom early while the ground is moist from spring snows and rains, and by the time the showers cease have fruited and dried up leaving only the bulbs and seeds, the former so protected by the depth or papery scales or interlaced fibers as to resist the drougth and intense heat of summer as well as the cold of winter. The sego has an additional factor in producing a new bulb each year below the old one, and so as it grows

older it buries itself the deeper, it also has seeds and pods specially fitted for easy distribution by the wind. These characters of the bulbous plants point toward a colder climate farther south than now, followed by a more arid and hotter one. Since plants with herbaceous stems and perennial roots, because of the excessive reduction of surface in winter, are specially fitted to endure a climate with great contrasts between the seasons, we find them forming the bulk of the vegetation in the moist Temperate Zone. Curiously enough annuals with the most reduction possible in surface are increasingly scarce as we approach the Poles. This may be due to the danger of the seeds rotting or starting in the fall because of the moisture, while no such danger confronts them in the deserts. In our region perennials are subjected to trying experiences with freezing and thawing which are very harmful, and so they protect their buds and roots by a copious growth of hair. wool, scales, or resin. This effect is due to the excessive rainfall in the winter, and to the fact that snow does not lie on the ground long. This again produces an anomaly in our plants being more hardy than those farther north where the snow forms a warm blanket which never leaves till spring comes and therefore the buds do not protect themselves so much. It is a fact that there is a wide belt in about our latitude where spring is much prolonged and therefore the season of frost, but farther north the season is much shortened and the danger of late frosts much lessened in relation to the beginning of Spring. This results in a narrow belt where the raising of tender fruits is possible much farther north than here, while there is a wide belt of uncertain crops to the south of it.

In a humid region where moisture is no object we find an abundance of leaves and little or no economy used in their structure, and little protection in the way of resin, gum, or hairs, but in a desert region where moisture is a matter of life or death we see every precaution use to save it. The leaves are small, often reduced to scales and the bark of the stems performing the office of leaves, th leaves are mostly leathery, hairy, scaly, or resinous, and with elaborate devices for reducing evaporation. Since in such regions the vegetation is scanty there has to be special protection against enemies, and so we find an unusual development of spines, prickles, strong odors, rough hairs, etc.

There are many other minor factors which enter into the distribution of a species, such as character of flowers, flowering period, length of reproductive season, vitality, size, protective coloration, fragrance, medicinal quality, habits and places of growth, etc., but time would fail me to even mention them all. I have, however, given the most important and present not only them but nearly all others in my schedule of Plant Adaptation appended.

In conclusion let me say that I find the chief factors of distribution are varying humidity and temperature, assisted by wind movements and animals, and modified by barriers and, in individual species, by innumerable devices to meet the demands of climatic changes.

Delivered April 7, 1900.

MONOGRAPH OF THE NORTH AMERICAN UMBELLIFERAE.

Coulter & Rose.

Immediately after the publication of this paper the writer was requested to write a review of it and prepared it, but the paper has remained in his hands unpublished from press of other matter till now. It seemed desirable after six years to revise it in the light of recent studies of certain genera in the family, the body of the paper remains as at first prepared. The criticism of their treatment of certain genera is remanded to another part of this paper.

The first monograph of this family prepared by these authors nearly twenty years ago, was the work of Mr. Rose, chiefly when he was new to systematic botany, having but little field experience with the plants treated. The defects in this excellent paper were such as would be expected under the circumstances. They were lack of care in the preparation of keys, lack of knowledge of types, and absence of knowledge of ecology and the resultant undue emphasis of trivial characters in certain cases. But the conception of species and genera was for the most part that of Gray and corresponded with the limitations as they occur in nature with the exceptions noted. An illustration of the inaccuracy of the keys is found in Angelica genuflexa, which cannot be found either in the original or the recent monograph in any other genus but Conioselinum. There has been no improvement in the last monograph in this respect for the species of the new genera cannot be found in many cases in the proper genera such as the segregates from Cymopterus and Peucedanum, Pseudocymopterus, etc. There is much looseness in both the generic and specific descriptions. In the matter of ecology there is little improvement showing but little field study, but in the matter of study of types there has been great improvement, and also it shows a wealth of study of herbarium material which is very good in its way but never can take the place of study of the plants as they grow. Many problems of the herbarium become nothing in the light of field work. It is a fad with some collectors to gather the most aberrant material and send that in with the hope that the individual may get his named immortalized (execrated) by the publication of

a new name dedicated to him, when an honest botanist would seek for all the connecting forms where he got his aberrant. ones in order to determine its origin which in nine cases out of ten would be settled at once. Our herbaria are loaded up with such stuff. There are a number of such fictitious species recognized in the latter paper.

In the matter of specific and generic limitation there has been a wide deviation from the accurate method of the first paper, even genera have been founded on such a trivial character as the excessive wrinkling of wings, such as Rhysopterus for example. In his first paper in commenting on my Cymopterus corrugatus, he criticises my statement as to the greatly wrinkled wings intimating that it is a character of no consequence while in the new monograph he makes that a generic character. The creation of new genera has been treated in detail elsewhere.

Lack of field study is shown in keeping up Coloptera Fendleri, Newberryi and Parryi, though he follows the writer in relegating C. Jonesii to synonymy. A very little field work would show them that Newberryi is only a form of Fendleri, and Parryi of glomeratus (all now being relegated back to Cymopterus). The same thing is shown in Leptotaenia multifida and Eatoni on the fictitious character of presence or apparent absence of oil tubes, Ligusticum is another genus treated in the same manner, and in Cicuta where he has followed Greene in the supposed character of the roots. Other evidence of lack of field work is shown where he says that Cymopterus globosus (p. 183) is a "very rare species" while in fact it is a very common species. Pseudocymopterus montanus var. purpureus is another case where a variety is kept up on a character which we find on different parts of a plant from the same root, though it is not so bad as Greene's species of Prunus where he founds two species from specimens of mine taken from the same plant.

We find an adherence in this paper to the discarded nomenclature of the Brittonian school which never was adopted by the botanists of this country and to which the authors were opposed but had to submit as the nomenclature was controlled by Coville. The use of this system caused the resurrection of many discarded names and the unnecessary changes of many names, which the Vienna code now relegates to synonymy.

Another defect in this paper is the artificial arrangement of genera which causes closely related genera to be widely separated such as Leibergia which is only a species of Peucedanum, Oreoxis which is only a subgenus to Cymopterus, and Lomatium which runs almost into Cymopterus.

There is a great improvement in the figures (which was suggested by the writer in his treatment of Cymopterus) in that they have abandoned the use of water soaked and therefore greatly distorted fruit.

Mr. Rose defends this treatment of genera on the ground that it has become a fad to split up genera, and species, which is the best argument the Brittonians have ever advanced for it, and which is no argument at all. If there is nothing better than a fad to cause the making of about 30,000 new combinations in five years where there are but little over 10,000 species, it is about time to call a halt. The Brittonian nomenclature was said by its authors (see Underwood and Pollard in the Torrey Bulletin in 1895) to have settled forever the question of names and given us a stable system but since then in any one year up to the present there have been twice as many changes of names as occurred in any ten years previously and the manufacture is still going on at full blast, some writers superseding themselves two or three times (see Greene and Rydberg), in addition the new Vienna code has relegated the whole system to the back woods where it belongs as to names in established genera, but unfortunately does not touch the greater evil of dismemberment of genera.

The splitting up of genera is quite uneven and shows a lack of uniform study in the family. Cymopterus is pretty well chopped up, but is still capable of being split (what remains of it) into three more pieces as good as those already lopped off, while Aulospermum (one of the splinters) can be again split in two equally as well. It is the opinion of the writer that if this dismemberment is to be resorted to it should be consistently carried to the limit and not halt half way, nor should it fail to be applied to all genera equally.

There is an unevenness in the recognition of names, as my Cymopterus Utahensis var. monocephalus is reduced though it is as good a variety as the var. Eastwoodae both ecologically and morphologically, while they still keep up the spurious Pseudocymopterus montanus var. purpureus, which sometimes has the two forms on the same root.

There are certain genera to which the writer has given many times the amount of field work that the authors have. Among them the chief is Cymopterus. This genus is a good illustration of the whole Brittonian system, and of the unscientific results which follow its dismemberment. Mr. Rose claims that if it is kept up on the lines of Watson and Gray it will not hold together because of the variant groups of which it is composed and so to avoid this evil he splits it up into seven genera, none of which will hold together even as well, and therefore he increases the difficulty seven-fold, and if he were consistent he should have split it into six more genera which would have augmented the trouble thirteen-fold. The genera created are Oreoxis which is not separable from Pseudocymopterus; Phellopterus, which is not separable from Cymopterus proper; Pteryxia which also runs into Cymopterus. Aulospermum can be again separated into two genera just as good as itself, the one to include longipes, glaucus, Watsoni, and Ibapensis; and the other the remainder. Cymopterus proper as he recognizes it is divisible into three equally good genera, one to include acaulis, Parryi, Leibergi; another globosus; and the third megacephalus, Fendleri and its var. **Newberryi** (Peucedanum Newberryi Watson Am. Nat. 7,301). This last is the best genus in the whole batch created by Coulter & Rose and was called Coloptera, but after the writer's criticism of it in his Contributions No. 4 it has been merged into Cymopterus. They have also followed me in keeping Cymopterus lapidosus in this genus. Other genera created from Cymopterus are Rhysopterus which has nothing whatever to keep it distinct from Cymopterus proper, Aulospermum, or Phellopterus. An unwise action is the creation of Rhysopterus Jonesii from immature material. The writer has had for twenty years five times as much material of this form as the authors have seen but he never dared to name it. Pseudocymopterus is another fictitious genus which might just as well be split into nearly as many genera as it has species.

Peucedanum has been properly thrown over and an old and untenable Rafinesquian genus resurrected in its place, with the resultant renaming of the whole batch of species. They, however, split off Euryptera and Cynomarathrum, and to the latter add six species out of a possible valid three, but they omit to split it up into two as good genera, one to contain Peucedanum Kingii and its variety, and the other the remaind-

er. Euryptera bears the same relation to Peucedanum that the latter half of Aulospermum bears to Cymopterus proper. Lomatium the new creation for Peucedanum proper they have not split pari passu, yet they should have done so as to be consistent, and should split it up as follows; one genus for the species from the beginning to Watsoni, one genus from there to tomentosum, one or two more from there to Sonnei except alatum, another of alatum and anomalum. They failed to throw bicolor into Leibergia which is congeneric with Peucedanum through P. ambiguum.

Cicuta is another genus in which they have followed Greene too far. Hydrocotyle and Osmorhiza are other genera too floridly treated.

The writer has tried to point out the defects in this otherwise admirable paper of Coulter and Rose. Taking it as a whole this is the best thing that has ever been published on North American Umbelliferae, and makes it possible for any botanist to identify his plants easily except where the keys are at fault which is not frequent. The citation of specimens is convenient for those from whose herbaria they have come, especially where the collector was uncertain of the species.